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ABSTRACT

This document combines a review of Wisconsin technology initiatives and related research with outlines of components needed for a comprehensive educational technology system to serve all Wisconsin citizens. The long-range statewide plan is intended to enhance elementary and secondary academic achievement through proper use of state-of-the-art technologies and professional staff development. Implementing the plan will lead to the achievement of the National Education Goals, state academic content standards, and state student performance standards while assisting in the effective restructuring of education in Wisconsin public schools. The document is divided into eight sections: Introduction; Study Methodology; State Technology Planning; Local Technology Planning; Funding Issues and Strategies; Legislation; Recommendations/Implications; and Appendices. State technology planning is emphasized in the document and covers the following topics: (1) statewide communications network design principles; (2) curriculum and assessment; (3) instructional technology; (4) professional development; (5) equity, access, and use; (6) educational accountability and reporting system design; (7) learning environments; (8) technology standards, procurement, and maintenance; (9) staffing and organizational structures; (10) policy, regulations, and guidelines; and (11) monitoring and evaluation. (Contains 57 references.) (SWC)

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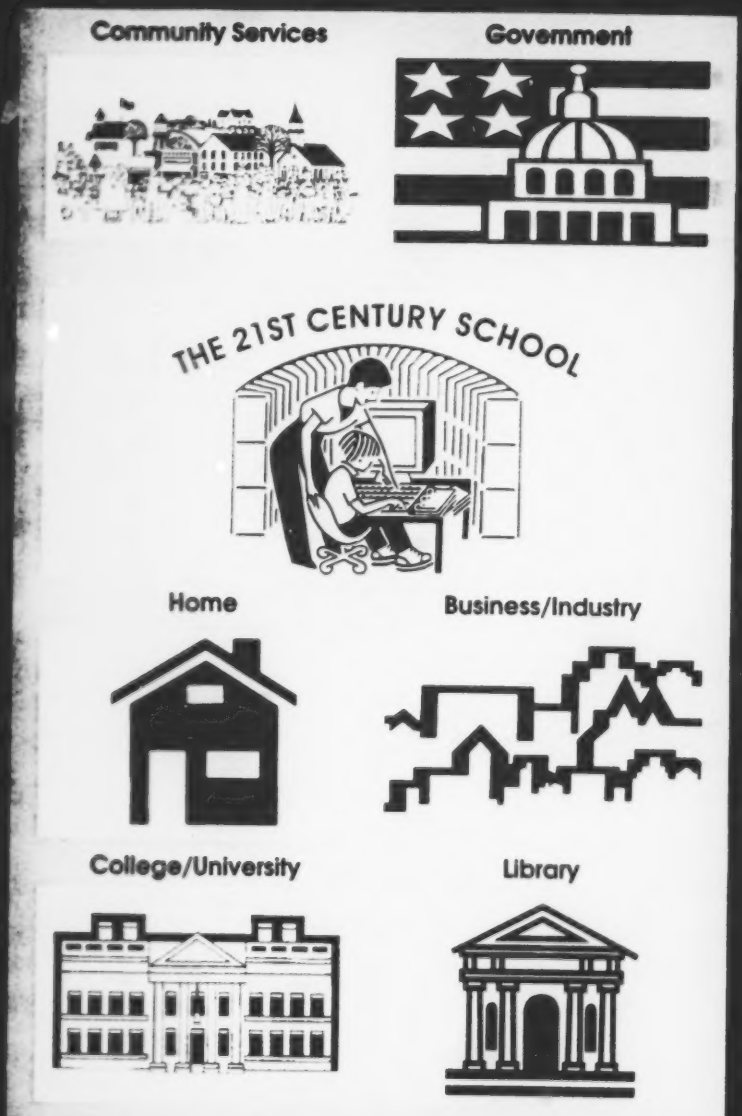

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Foreword

Wisconsin has a long and proud tradition of progressive public education coupled with a commitment to equal educational opportunities for all children. Not only must we strive to adapt rapidly advancing technologies so they provide meaningful learning opportunities, but we must ensure that those technologies are available to urban, suburban, and rural children alike. It is a challenge as much as it is a necessity.

For nearly a year, the Wisconsin Technology Task Force worked collaboratively to develop *The Wisconsin Educational Technology Plan PK-12*. This group represented many educational associations, various state agencies, and educators at all levels, including higher education.

The purpose of this long-range statewide plan is to enhance elementary and secondary academic achievement through proper use of state-of-the-art technologies and professional staff development. Implementing this plan will lead to the achievement of the National Education Goals, state academic content standards, and state student performance standards while assisting in the effective restructuring of education in Wisconsin public schools.

During the development of *The Wisconsin Educational Technology Plan PK-12*, the technology task force met in several locations throughout the state to observe "best practices" and to hear reports from various districts, state agencies, and consortia. The task force also reviewed state and national educational technology initiatives and recommendations.

The emphasis in this plan is on the importance of planning at the state, regional, district, and local school levels; professional development; and the integration of technology as a tool into the teaching and learning process. Specific implementation strategies will be developed along with an electronic workbook for local district planning.

By implementing this plan, school districts will provide equal opportunities for all children and teachers in Wisconsin to use current technologies and resources in their educational program. The plan will also allow administrators to lead their districts in technology planning and implementation. It is designed to prepare Wisconsin students for the social and economic environment of the 21st century.

We hope this plan will be useful as you integrate instructional technology into your curriculum.

John T. Benson
State Superintendent

Preface

The Wisconsin Educational Technology Plan PK-12 is the culmination of planning and research by a group of Wisconsin educators and other representatives as required by the federal funding source *Goals 2000: Educate America Act* that formed the Wisconsin Technology Task Force. The *Educate America Act* provides local school districts the opportunity to restructure education using their own creative methods. The Wisconsin Department of Public Instruction (DPI) contracted with a national consulting firm, the Center for Educational Leadership and Technology (CELT), to assist a statewide study to lay the foundation for continued planning in the development of a comprehensive educational technology system to serve all Wisconsin citizens.

The Wisconsin Educational Technology Plan PK-12 combines a review of Wisconsin technology initiatives and related research with outlines of components needed for a Wisconsin educational technology system. An introductory section sets the expectations for the reader and reviews the overall vision and mission used to guide development of the plan. Section 2 describes the methodology employed to gather data and the information used in developing the plan. The main body of the document (section 3) provides recommendations for actions and responsibilities at the state level, describing how the state should address the following 11 components:

- statewide communications network design principles;
- curriculum and assessment;
- instructional technology;
- professional development;
- equity, access, and use;
- educational accountability and reporting system design;
- learning environments;
- technology standards, procurement, and maintenance;
- staffing and organizational structures;
- policy, regulations, and guidelines; and
- monitoring and evaluation.

Each part of section 3 briefly describes the findings of the technology task force and, where appropriate, suggests recommendations for improvement. Section 4 reviews the importance of technology planning at the school district level. Section 5 discusses funding issues and strategies. Section 6 makes recommendations for legislative support of the statewide educational technology plan. The final section summarizes recommendations and implementation. Footnoted material is listed in the References (appendix B).

The purpose of the plan is to increase use of state-of-the-art technologies to enhance elementary and secondary student academic achievement and Wisconsin educators' professional development in support of the *National Educational Goals*, *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*, and performance standards. Wisconsin Governor Tommy Thompson addressed the importance of technology in education reform in his 1996 State-of-the-State address when he said, "Our partner in achieving higher academic performance in our schools is technology."

The Wisconsin Technology Task Force recognizes that more planning is needed in the form of specific implementation strategies to ensure the development of the proposed comprehensive education technology system. *The Wisconsin Educational Technology Plan PK-12* is not an end. Rather, it is a means to gather support for progress and to engage the whole Wisconsin community in developing a critically needed educational resource system.

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Many individuals contributed time and expertise to research and develop this report on educational technology for Wisconsin's schools. Where applicable, a task force member's affiliation or area of expertise is indicated in the line after his or her name.

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Wisconsin Educational Technology Plan PK-12
Executive Summary

Purpose

The primary purpose of *The Wisconsin Educational Technology Plan PK-12* is to improve student performance and enhance the teaching and learning process through the effective use of technology. The study findings make clear that Wisconsin schools lack the technology resources necessary to ensure an equitable educational opportunity for all Wisconsin students that will adequately prepare them for the 21st century.

Background: Why must things look different?

Wisconsin schools are committed to ongoing improvement in teaching and learning that reflects the changing requirements of the social and economic environment of the 21st century. In recent years, schools across the United States have invested heavily in educational technology to facilitate teaching and learning. Florida, Kentucky, North Carolina, and Massachusetts provided major technology funding for all their school districts. A considerable amount of research measures the effectiveness of instructional technology in the classroom. This research clearly shows improvements in student achievement, self-concept, and the quality of interactions between teachers and students. One striking aspect of the research reveals that teachers who took courses or professional development in educational technology obtain significantly higher levels of student performance across many curricula and grade levels. Teachers and administrators report many benefits from using educational technology to improve productivity and to manage classroom and student information.

Impediments

Effective incorporation of technology into the curriculum is receiving much attention in K-12 schools. The task force's review of the literature, prior state surveys and reports, and focus group interviews revealed that in Wisconsin:

- Most school districts do not have comprehensive technology plans that cover curriculum integration, building infrastructure, and telecommunications.
- Few local funds are allocated toward major technology enhancements, in part due to revenue caps.
- Technology spending is not focused on a clear set of priorities.
- Little equity exists across districts in technology spending.
- Only 10 percent of the districts employ full-time technology coordinators.
- Most technology coordinators also teach more than half time.
- Few districts have comprehensive technology staff development plans.
- The amount of inservice available to classroom teachers varies greatly.
- While distance learning is a state priority, relatively few districts have comprehensive distance learning plans or the technical capabilities to receive and distribute instructional programming.
- Some library media centers are innovative in technology integration techniques but lack resources to make an impact on classrooms.

The Vision

To maintain its competitive edge in the United States and the world, Wisconsin must also adapt to a rapidly changing technological environment and provide its future leaders with the tools to learn.

What will PK-12 Education Look Like in the Year 2000?

By the year 2000:

- Workstations and networks capable of supporting dynamic educational activities will be readily available to all Wisconsin school children.
- Telecommunications, the Internet, and distance learning will allow all students to use vast external resources as part of their educational program.
- All teachers and students will have access to, and the challenge to create, a new generation of educational resources.
- Leadership in technology planning and implementation will be a major focus for administrators.

What Differences will We See in Education if This Vision is Realized?

A community of lifelong learners will be established in Wisconsin. Through technology, students will be motivated learners, have high self-esteem, and gain the skills and confidence required for success in the workplace. They will be more active and independent learners, responsible for more of their own learning.

With the abundance of technology, teachers will become less the single sources of knowledge and more the facilitators of learning. Distance learning courses will increase the scope and depth of numerous curriculum offerings. Actual student work samples will be readily shared from teacher to teacher, grade to grade, school to home, and school to employer.

School and district leadership, including board of education members, will model appropriate and effective uses of technology when performing their administrative tasks. Improved communications will reduce isolation among teachers and administrators and will establish unprecedented levels of sharing and understanding. Telecommunications services will greatly enhance school, teacher, parent, and community communications for school news and for specific student issues and concerns. Schools will adopt highly efficient student management and security systems and cost-effective means for managing information, transportation, facilities maintenance, and utilities consumption.

How Will These Results Affect the Community?

Fulfillment of this vision will help all Wisconsin students strive to reach their academic potential and enable teachers and administrators to meet the established local, regional, state, or national standards for learning. The effective coordination of services with community partners will prepare graduates to establish productive careers and family lives, participate effectively in a democratic society, and prepare them for lifetimes of personal growth and learning. As individual schools and districts guide Wisconsin students in using technology for learning and productivity, a capable and knowledgeable work force will be a resource to attract and retain business and industry in Wisconsin.

Recommendations for Statewide Educational Technology Planning

The task force recognizes that students must become proficient with technological tools and that education professionals must use these tools to improve the educational system. Accomplishing these objectives requires equipment, software, interconnected networks, and, most of all, changes in how teachers teach and how students learn. Such monumental changes will not come easily and will require much time and effort. The task force has made many recommendations. Some of the most critical are summarized below.

State Technology Planning

The technology task force expects the state to provide leadership and guidance by articulating the vision of educational technology systems, setting priorities for implementation, and aligning

the resources necessary to provide and coordinate the statewide technology infrastructure. The Wisconsin Department of Public Instruction (DPI) can expand technology leadership, support, and coordination for school districts across the state. The technology task force's needs assessment clearly indicates a desire for the DPI to serve school districts' needs in these areas.

The DPI must maintain a strong instructional technology unit before it can begin to serve in a leadership capacity. Current responsibilities associated with educational technology are dispersed among several individuals in the DPI and other agencies. This practice contributes to the concept of "isolated islands of information," which inhibits the development of a systemic and comprehensive approach to technology planning and information dissemination.

The state should make educational technology accessible and affordable throughout Wisconsin by developing regulations and standards that will facilitate the construction, operation, and interconnection of affordable statewide networks. This would include administrative rules for approving consolidated federal grants that encourage districts to spend federal grant funds for equipment, professional development, and technical support to integrate technology into curriculum.

The state should develop a statewide PK-12 foundation to solicit technology-related donations on behalf of all school districts and to negotiate licensing agreements in conjunction with Department of Administration (DOA) purchasing, the University of Wisconsin System, and the Wisconsin Technical College System. Incentives should be provided for telecommunications providers to contribute to this foundation.

The state should encourage, through policy and programs, linkages between school and home. This can be done through arrangements with vendors to reduce costs of advanced technology for parents and students, tax incentives, and/or other appropriate means.

Curriculum and Assessment

The current requirement to integrate technology into all subject areas and grade levels of the PK-12 curriculum is correct and necessary. Failure to accomplish this goal must be addressed.

The human component is one of the most important aspects of any technology plan. To make the best use of staff resources, to support the orderly and integrated flow of information affecting curricular decisions, and to serve as a foundation for building integrated curricula, the following resources must be in place:

- time for planning, sharing, and staff development;
- necessary funding at the national, state, regional, and local levels; and
- guidance and support during the ongoing change process.

Technological tools can enable educators to develop and align curriculum, learning, and assessment. The following recommendations will assist Wisconsin in developing, integrating, and distributing curriculum information:

- conduct an analysis of curriculum development and instructional management needs at the school, district, and state levels;
- evaluate existing curriculum development/instructional management software applications; and
- create a source for locating and acquiring appropriate software and licensing to meet Wisconsin's curriculum development and instructional management needs.

Technology for Lifelong Learning

Students must develop the skills to become lifelong, engaged learners for individual success and for the economic stability and development of the community. This requires interweaving content objectives, process skills, and technology competencies at all levels of instruction.

Wisconsin has the responsibility, through its schools, to prepare all students for the challenges they will face in a highly technological society. Technology will become increasingly pervasive as a set of tools to manipulate text, numbers, graphics, and video. Students must become the masters of these tools.

Professional Development

Rapid change of staggering proportions within the field of technology necessitates a commitment to ongoing and sustained professional development opportunities. All professional development should model and include the use of current and emerging technology resources. Without such a commitment on the part of the educational community, no amount of planning will yield success.

Educational leaders must establish benchmarks of technological competencies for Wisconsin educators. Such benchmarks will facilitate more effective staff development and educational activities.

A key element inherent in the design of effective professional development in Wisconsin is a multifaceted approach to its implementation. Educators must:

- share effective technology-infused integration practices with their colleagues;
- utilize the technology itself as a tool to learn and teach about technology; and
- use new developments in telecommunications to provide educational opportunities previously unavailable.

Educators must capitalize on available resources as a means of enhancing their own professional development, effectively using technology to learn technology. Available resources must include:

- hands-on training workshops;
- telecommunications;
- distance learning;
- field-based graduate degree programs;
- institutes;
- project-based learning; and
- models/preview centers.

Teacher Certification

A set of benchmark standards for technology competencies for teachers should be developed and implemented for Wisconsin PK-12 educators based on such criteria as the International Society for Technology in Education Standards. Changes need to be made in the certification and recertification requirements. Students in teacher education programs must be required to be technologically competent before they reach the classroom.

Wisconsin must improve teacher training programs by:

- providing the necessary financial and technology resources and directing the higher education community to ensure that newly certified teachers enter the classroom with appropriate technological skills;
- assisting school districts in creating coherent professional development plans;
- linking professional development in technology to recertification;
- linking schools, districts, and individuals with private-sector partnerships, higher education, and other resources for professional development; and
- changing certification and recertification requirements pertaining to technology. This is an essential component of teacher preparation, and changes are slow to evolve. This will require greater flexibility in learning experiences and opportunities for Wisconsin educators.

Equity, Access, and Use

Equity and access issues are central to any technology plan. Equity refers to the availability of instructional technology to all students regardless of socioeconomic status, culture, religion, gender, age, or race. The state cannot make the results of technology perfectly equitable for all students, schools, and districts. The state can, however, lay the groundwork for equity across all districts by providing funding for a common base of technology.

The success of *The Wisconsin Educational Technology Plan PK-12* to achieve measurable gains in student performance depends on sufficient infusion of technology, accompanying training, and

ongoing maintenance, replacement, and support. Reaching critical mass in technology resources for district schools means that, within the immediate future, the following conditions must be met:

- The ratio of students to contemporary instructional workstations will be no more than 5 to 1.
- Each classroom will have access to equipment to support video, voice, and data networks.
- Each district will have access to equipment for originating and receiving distance-learning transmissions.
- Each district will install local- and wide-area networks with access to global networks.

Accountability and Reporting

The Wisconsin accountability and reporting system must be designed to support the use of technology for improving the ways work is carried out by educators, instructional leaders, policy specialists, and those responsible for oversight. Sharing a compatible set of applications will enhance communications at all educational levels, improve usefulness, timeliness and quality of information, and will be structured to reduce costs to local districts. Costs for data requested by state agencies will be paid for by the requesting agency. Specific recommendations include the following:

- establish a standardized statewide student records system; and
- fully implement an integrated statewide data collection system and an enterprise database.

Administrative Technology Utilization

To provide the leadership necessary within their buildings and districts, administrators must adopt and use technology for their own purposes and as a model for staff members. For example, district and building administrators frequently need answers to similar questions. Administrators must use desktop technology, have needed authorization, and be trained to use district and state enterprise databases for decision support.

Learning Environments

Linking specific learning environments to instructional activities involves the alignment of instructional reform efforts, developmental needs of the learner population, staff competencies, and specific technology applications.

The governor, legislature, state agencies, and leaders in the private sector, community, and education are responsible for ongoing development and maintenance of a statewide technology infrastructure. In addition to being an important and functional educational resource, this statewide system must provide effective safeguards to protect the privacy of its users.

The DPI must play a central role in school facilities design and upgrade activities. This role should focus on providing support to the students, educators, schools, and districts by:

- setting appropriate standards for facilities to ensure inter-operability and equity;
- leveraging and brokering existing expertise within the state; and
- developing district/regional capacity in facility design.

Design criteria for learning environments include access to the following basic components:

- workstations;
- local-area networks (LANs);
- wide-area networks (WANs);
- Internet;
- community networks;
- regional networks; and
- statewide network.

Implementation of a comprehensive upgrade of the technology infrastructure and environments in Wisconsin schools should be a joint effort at the local, regional, and state levels with partnerships between government and the private sector.

Wisconsin must develop a standard process for designing new and remodeling existing buildings that will ensure all stakeholders are involved at the proper stage of the project and that responsibilities of all players on the building team are clearly understood. The process must be supported

by well-designed forms, procedures, and software tools to facilitate communication among groups and effective task execution.

Technology Standards, Procurement, and Maintenance

Educational technology follows a life cycle encompassing the development of technical standards, procurement of technology, and maintenance of that technology throughout its useful life.

To create the best educational results and generate the highest level of return on investment, each of these steps must be addressed in a coherent manner:

- DOA will convene a technology standards committee to track technology and product improvements and update the technology standards being recommended in this document.
- The Wisconsin technology infrastructure and systems will be built using many different types of products from many different vendors.
- The design of the Wisconsin technology system will rely as much as possible on widely accepted standards and features that can be met by multiple vendors while ensuring compatibility among various state networks.

Wisconsin's education leaders and citizens must view technology maintenance broadly as a process aimed at keeping technology components as productive as possible in the most cost-effective manner. School district leadership must budget sufficient funds annually to maintain existing equipment. Beyond simply troubleshooting and repairing broken equipment, maintenance must address end-user support, upgrading equipment and shifting it to another use when it no longer meets user requirements, and disposing of and replacing obsolete equipment. Without adequate technical support, money spent on technology is money wasted.

Changing Roles of Teachers and Institutions of Higher Learning

The pervasive use of technology in the 21st century school will necessitate additional roles and responsibilities. Among those most affected by these changing roles are classroom teachers and institutions of higher learning.

The influx of technology has drastically changed the role of the classroom teacher. More frequent use of technology in the classroom increases the need for:

- careful scrutiny of preservice teacher training;
- professional inservice and other staff development; and
- incentives for teachers to become involved.

Faculty at Wisconsin institutions of higher education are responsible for being involved in the infusion of technology into the PK-12 curriculum. Faculty from all areas of these institutions, not just colleges of education, play an important role in modeling the effective use of technology. The collaboration between college faculty and PK-12 teachers reaps numerous benefits for all.

Regional Consortia

School districts must have sufficient staff and technology resources to meet the need for information on effective use of technology. Regional consortia are needed to provide professional development opportunities and information on advances in technology and effective technology practices.

Regional consortia or providers such as the cooperative educational service agencies (CESAs) should facilitate:

- communication to local school districts on effective technology planning considerations, practices, and guidelines;
- training and professional development for equipping district- and building-level leaders with information and strategies on how to develop basic technology skills and competencies for all educators; and
- assistance to school districts on the development, implementation, and updating of technology plans.

Wisconsin should encourage the establishment of community consortia to develop strategies for assessing and meeting community network needs.

Recommendations for Local Educational Technology Planning

At the school district level, leaders should review their educational programs in light of educational reforms; local, state, and national goals; and the need for appropriate learning and instructional management technologies. All schools must be equipped for voice, video, and data communications and for interconnection with external networks and resources as appropriate.

Every district must develop a local plan for integrating technology into the curriculum. Planning efforts must focus on the improvement of teaching and learning and the enhancement of effective district, school, and classroom management. Improved student performance is the major reason for infusing educational technologies into the learning process and is also the primary catalyst of community support. Curriculum improvement strategies, affecting all students, must be the cornerstone for educational technology integration efforts in Wisconsin schools.

The DPI should take the lead in establishing overall policy for program planning and funding and system implementation, operation, and use. The preparation, organization, and effort that accompanies any strategic planning activity typically pays dividends in terms of time, energy, and resources to achieve desired goals. This is especially true relative to educational technology planning at the school or district level. This plan emphasizes facilitating local technology planning. It provides an outline of long-term strategies that must be considered and recommends the following:

Electronic Planning Workbook

DPI will develop an electronic planning workbook to help districts and schools with the technology planning process. Closely aligned with the tasks identified in the technology planning model, this workbook would provide educators with printed and electronic versions of tools and templates to facilitate data gathering, consolidation, and manipulation for decision-making. References to additional planning resources would be included in each section of the workbook. As districts complete the activities in the workbook, they would create components of their district educational technology plans.

Clearinghouse of Printed and Electronic Materials

A wide range of support should be made available to technology planning committees and interested educators. A clearinghouse of printed and electronic materials that focus upon the planning processes, education reform, systemic change, and existing and emerging information technologies should be developed and monitored by the DPI and regional consortia or providers.

Planning for Professional Development

Failure to consider the professional development required for educators to effectively integrate equipment and resources into the learning process can be a significant obstacle to successful technology planning and implementation. Without sufficient professional development, educators may not use educational technology enough, or use it simply to automate older instructional methods or to deliver outmoded curriculum. Teachers and administrators must develop new skills, knowledge, and attitudes for applying information technologies in support of education reform as reflected in the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*.

Funding

Wisconsin's investment in educational technology must increase if students are to maintain their competitive advantage. The primary responsibility for funding local technology systems lies at the district level. However, the responsibility for installing, funding, and supporting a statewide advanced technology infrastructure rests with the state. State policies and the funding system for public education must support these goals.

State policies, programs, incentives, and initiatives, combined with direct state funding for advanced technology infrastructure, are necessary components of any plan that will improve access to

technology for all Wisconsin students. The state must permanently fund regional consortia to deliver technology service expertise to assist school districts in implementing technology planning, procurement, and cost-effective implementation.

The task force recommends the following specific practices and policies:

- Fund the DPI so it can maintain a strong instructional technology unit to expand technology leadership, support, and coordination for school districts across the state.
- Allow a board of education to borrow, without referendum, up to $1 million aggregate or up to $1,000 per student (whichever is greater) to fund buying technology equipment, telecommunications and distance education contracts, retrofitting buildings, and providing advanced technology support. Repayment of principal and interest would be exempt from revenue caps.
- Reserve at least 50 percent of the annual Educational Technology Board (ETB) and Wisconsin Advanced Telecommunications Foundation (WATF) funds for noncompetitive allocations to Wisconsin public school districts. This will help ensure equitable access to technology for all Wisconsin students by providing funds to schools that cannot afford to hire grant writers.
- Continue to combine state and private funds to provide grants to public schools, through the ETB and WATF, to purchase technology equipment, telecommunications and distance education contracts, retrofit buildings, and provide advanced technology support.
- Provide for significant increased staff resources to the ETB grant and loan program.
- The Wisconsin Public Service Commission, following guidelines in the federal Telecommunications Act and policies in other midwestern states, should
  - provide permanent rate relief for libraries, schools, CESAs, and accredited institutions of higher learning to support the ongoing costs of using telecommunications systems; and
  - establish a policy so all Wisconsin citizens will be able to call any school in the public school district where they reside without incurring long distance telephone charges.
- Provide substantial permanent state funding for regionally based technology services to schools. These services could include planning, grant-writing, network support, purchasing, and professional development. Organizations such as technical colleges, universities, and/or regional consortia (such as CESAs) could provide these services.
- Provide high-speed Internet connections for all schools, libraries, and higher education institutions in Wisconsin at equitable and affordable rates. This might be accomplished by providing permanent state funding for the installation and annual operating costs for high-speed, high-capacity Internet hubs located at regional centers such as technical colleges, universities, and/or regional consortia such as CESAs.
- Promulgate state rules for approving consolidated federal grants that encourage districts to spend federal grant funds to purchase equipment, support, and professional development for technology.
- Provide permanent state funding to the DOA budget to interconnect the current and proposed regional fiber optic networks.
- Provide funding for a statewide DOA purchasing position dedicated to negotiating statewide and regional educational contracts in coordination with the University of Wisconsin System, Wisconsin Technical College System, and other purchasing consortia.
- Develop a statewide PK-12 foundation to solicit technology-related donations on behalf of all school districts and to negotiate licensing agreements in conjunction with DOA purchasing, the University of Wisconsin System, and the Wisconsin Technical College System. Offer incentives for telecommunications providers to contribute to this foundation.
- Encourage, through policy and programs, linkages between school and home through arrangements with vendors for reduced costs of advanced technology for parents and students, tax incentives, and other appropriate means.

1. Introduction

The late 1990s are an exciting time for Wisconsin schools as critical educational improvement programs are linked through a compatible educational technology infrastructure. As teachers, administrators, school staff, and parents attempt to reform and restructure schools, they must provide students with the skills and competencies necessary to compete in an information-based global economy. Students must be empowered through educational technology to create their own knowledge, think more critically, and communicate and solve problems more creatively and analytically.

The Wisconsin Technology Task Force represents a wide array of educational, governmental, and community interests within the state. It was assembled to undertake a comprehensive educational technology study to lay the foundation for a world-class education system for Wisconsin students. A structured process assessed the status and needs regarding educational technology. As education is improved, providing the appropriate support for technologies throughout the state will be important. Recognizing this, the Wisconsin Department of Public Instruction (DPI) coordinated a series of seminars and meetings in 1995-96 so each technology task force member could gain insight into the levels of technology functioning in Wisconsin schools. The task force worked with the Center for Educational Leadership and Technology (CELT) in assessing educational technology initiatives, identifying critical needs, and determining a course of action to build educational technology systems to serve students, educators, and communities throughout Wisconsin.

1.1 A Vision for the Enhancement of Schools and Learning

In the information age, with technology and available data changing constantly, the most important skill Wisconsin schools can give their children is the ability to continue learning. Lifelong learning skills will help Wisconsin residents meet the challenges of a changing society and economy. Computer technology is a powerful tool that can help restructure education so people keep learning throughout their lives. "Learning technologies have an enormous capacity to support and advance restructuring of teaching and learning," the Council of Chief State School Officers reported in a 1991 policy statement.

In recent years, schools across the United States have invested heavily in educational technology to facilitate teaching and learning. Florida, Kentucky, North Carolina, and Massachusetts provided major technology funding for all their school districts. These investments accompanied a considerable amount of research measuring their effectiveness. This research clearly shows how educational technology use benefits student achievement, self-concept, and the quality of interactions between teachers and students in the learning environment (Sivin-Kachala and Bialo 1994).

One striking aspect of the research reveals the importance of teacher education to achieve the full benefit of educational technology. Studies show that teachers who take courses or professional development in educational technology obtain significantly higher levels of student performance across many curriculum and grade-level areas (Becker 1994; Cates and McNaull 1993; Ryan 1991; Ryan 1990).

A wide variety of technology applications continues to be used with mainstream instructional practices. The rationale for using these applications in America's schools is to promote opportunities that ensure positive learning results. Further, these same technology applications are the common tools and standard equipment in today's world of work and advanced study. As a result, Wisconsin educators must embrace current standards for educational technology.

Classroom use of technological tools and applications enables educators to create a learning environment that provides the means by which students:

- become responsible for their own learning;
- focus on identified learner outcomes;
- engage in collaborative work efforts;
- apply learning to real-life situations and experiences;
- enhance critical-thinking, problem-solving, and decision-making skills;
- demonstrate progress and mastery of educational goals; and
- learn and apply technological skills necessary to succeed in the global work force.

Use of educational technology enhances problem-solving skills and critical thinking at all grade levels. Because of the qualities inherent in information technologies, learners can be effectively presented with opportunities to solve situational problems requiring the integration of higher-order thinking skills.

To maintain its competitive edge in the United States and the world, Wisconsin must adapt to a rapidly changing technological environment and provide its future leaders with the tools to learn. Teachers report many benefits from using educational technology as a productivity tool and for managing classroom and student information. Likewise, administrators report educational technology enhances efficiency.

1.2 Wisconsin Technology Task Force Vision

The Vision: What will PK-12 education look like in the year 2000?

By the year 2000:

- Workstations and networks capable of supporting dynamic education will be readily available to all of Wisconsin's schoolchildren.
- Telecommunications and distance learning will allow all students to use vast external resources as part of their educational program.
- All teachers and students will be able to access and create a new generation of educational resources.
- Administrators will lead their districts in technology planning and implementation.

Background: Why must things look different?

Wisconsin schools are committed to ongoing improvement in teaching and learning that reflects the changing requirements of the social and economic environment of the 21st century. Wisconsin's students must learn to:

- think critically and creatively to solve problems;
- access, analyze, evaluate, synthesize, apply, create, and exchange information;
- work cooperatively and productively with others; and
- participate in a global society.

Existing and emerging technologies will be essential in delivering these and other important curricular initiatives. Extensive voice, video, and data resources are commonplace and expanding rapidly. Indeed, technology is necessary to access much of the world's information. To use technology effectively and efficiently, students and teachers must learn new skills.

Just as in business and industry, technological links are necessary in education for:

- effective communication among school personnel and students;
- access to data for learning and decision-making;
- professional development and sharing of successful practices;
- record-keeping;
- assessment; and
- connections to other districts and educational institutions.

Results: What differences will we see in education if this vision is realized?

Learning

A community of lifelong learners will be established in Wisconsin. Students will be motivated learners, possess high self-esteem, and gain the skills and confidence required for success in the workplace. Students will learn how to learn with the assistance of technology. They will be more active and independent learners, responsible for more of their own learning. With abundant technology, teachers will become less the single sources of knowledge and more the facilitators of learning. Students and teachers will acquire effective presentation skills and use various forms of multimedia to share information throughout the curriculum.

Opportunities for actual and simulated career activities will make genuine learning experiences possible for all students, including at-risk students and those with special needs. Availability of technology during and after school for students, teachers, and community members will increase access to technology, helping the entire citizenry to deal with the challenges of societal and economic change after their formal schooling.

Teaching

New technologies will provide teachers with additional flexibility to individualize learning. By addressing multiple intelligences, providing multicultural experiences, and enabling multidisciplinary approaches, learning will be more student-centered. Teachers and students will work together on thematic and project-based units that may involve students from many locations working together. Through regional, state, national, and international (global) networks and satellite transmissions, distance learning courses will increase the scope and depth of numerous curriculum offerings.

New forms of performance-based assessment will help teachers evaluate students during the instructional process. Teachers and students will electronically store student work in video, audio, and text modes. Actual student work samples will be readily shared from teacher to teacher, grade to grade, school to home, and school to employer.

Administration and Management

School and district leadership, including board of education members, will model appropriate and effective uses of technology when performing administrative tasks. Technologies such as fax, voice-mail, e-mail, and video conferencing will improve communications, eliminate geographic barriers, and reduce the need for face-to-face meetings and travel. Improved communications will reduce isolation among teachers and administrators and build unprecedented levels of sharing and understanding. Telecommunications services will greatly enhance school, teacher, parent, and community communications for school news and in regard to specific student issues and concerns. Schools will adopt efficient student management and security systems and cost-effective means for controlling information, transportation, facilities maintenance, and utilities consumption.

Community benefits: How will these results affect the community?

Fulfillment of the task force's vision will help all Wisconsin students reach their academic potential and enable all teachers and administrators to meet the established local, regional, state, or national standards of learning. The effective coordination of services with community partners will prepare each graduate to establish a productive career and family life, participate effectively in a democratic society, and prepare him or her for a lifetime of personal growth and learning.

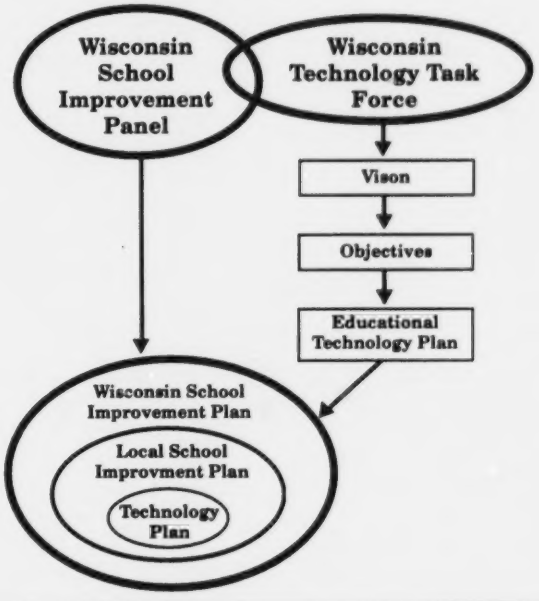
The innovative use of technology tools will provide a gateway to the world in the 21st century for all Wisconsin learners. As schools and districts lead Wisconsin students to use technology for learning and productivity, a capable and knowledgeable work force will be a resource to attract and retain business and industry in Wisconsin. This will ensure the continued economic development of the state. As learners become skilled users of technology, they will be able to participate more fully in public discourse. This will contribute to the continued development of a democratic society.

1.3 Study Overview

The Wisconsin Educational Technology Plan PK-12 was developed by the Wisconsin Technology Task Force, appointed by the state superintendent of public instruction. It will be integrated into the Wisconsin School Improvement Plan and address its goals and requirements (see Figure 1). The task force will work very closely with the School Improvement Panel responsible for developing the state improvement plan. There will be some overlapping membership of the panel and the technology task force to ensure the seamless integration of the technology component in the state improvement plan.

Figure 1

School Improvement/Technology Framework



1.4 Developing a Statewide Educational Technology Infrastructure

The governor, legislature, state agencies, business, community, and educational leaders are responsible for the ongoing development and maintenance of a statewide infrastructure. This infrastructure must support comprehensive educational technology systems enabling lifelong learning. Wisconsin educators should work proactively with the state to provide leadership and guidance by articulating the vision of a statewide educational technology infrastructure, setting priorities for implementation, and aligning the resources necessary to support development of the system. This will be especially critical as school districts identify the resources necessary to build the infrastructure for future educational reform programs.

At the school district level, leaders need to review their educational programs in light of educational reforms, state technology standards, and the need for appropriate learning and instructional management technologies. School district plans must address the impact of technology on student learning and equitable access to resources. Plans should detail hardware, software, local infrastructure, staffing, professional development, and program operation and maintenance. Plans must also address the ability to interface smoothly with other educational, governmental, and community organizations. Finally, an educational technology system must provide effective safeguards to protect the privacy of its users.

2. Study Methodology

This chapter provides an overview of the methods and activities of the Wisconsin Technology Task Force throughout the process of developing *The Wisconsin Educational Technology Plan PK-12*.

2.1 Project Management

To conduct this study, the Wisconsin Technology Task Force developed the following organizational design:

- a review of Wisconsin technology initiatives;
- an evaluation of other states' plans and initiatives;
- a needs assessment; and
- a comprehensive, integrated technology plan for Wisconsin public schools.

2.2 Task Force Membership

The Wisconsin Technology Task Force met monthly from June 1995 through January 1996. Department of Public Instruction (DPI) personnel assembled individuals from various backgrounds who are interested in improving Wisconsin education by making available 21st century technology for students and educators. Task force members represented a broad spectrum of organizations, including:

- DPI;
- professional educational organizations;
- other state and regional agencies;
- school districts; and
- higher education.

For a list of the members, see this report's Acknowledgments.

2.3 Data Collection Methodology

The Center for Educational Leadership and Technology (CELT) worked with the Wisconsin Technology Task Force to identify research methodology and data collection strategies. Methods included:

- an analysis of recent teacher/instructional staff surveys addressing technology;
- interviews with key stakeholders;
- topical focus groups;
- a review of Wisconsin documents about instructional technology; and
- research on technology plans of other states.

2.3.1 Quantitative Methods

The needs assessment's quantitative portion reviewed results of several educational technology surveys and reports conducted in Wisconsin over the past several years. These included:

- "Are Wisconsin's Schools Stuck in the Slow Lane?" (1996);
- Wisconsin Association of School Boards Legislative Issues Survey (Spring 1995);
- Wisconsin Instructional School Library Media Program Survey (1994);
- Wisconsin School District Computer Coordinator Survey (1993);
- Wisconsin Instructional Telecommunications and Technology Survey (1992); and
- Wisconsin Staff Development/Computer Integration Survey (1990).

The task force reviewed these instruments and summaries of their findings. While most surveys were conducted before 1996, they demonstrated an inadequately addressed pattern of need over several years. The surveys confirmed several beliefs widely held by technology task force members and revealed the following:

- Most school districts do not have comprehensive technology plans that cover curriculum integration, building infrastructure, and telecommunications.
- Few local funds are allocated toward major technology enhancements, in part due to revenue caps.
- Technology spending is not focused on a clear set of priorities.
- Little equity exists across districts in technology spending.
- Only 10 percent of the districts employ full-time technology coordinators.
- Most technology coordinators also teach more than half time.
- Few districts plan for comprehensive technology staff development.
- The amount of inservice available to classroom teachers varies greatly according to region.
- While distance learning is a state priority, relatively few districts have comprehensive distance learning plans or the technical capabilities to receive and distribute instructional programming.
- Some library media centers are innovative in technology integration techniques but lack resources to improve learning.

2.3.2 *Qualitative Methods*

Qualitative data were gathered using a variety of approaches that included:

- focus groups;
- key stakeholder interviews;
- document review; and
- technology task force meetings.

Focus Groups

In six 90-minute sessions, task force members offered their perspectives on the status of technology and on objectives. Task force members refined focus group protocols to address state concerns. CELT staff and task force members facilitated the focus group discussions. The topical areas covered in the focus group interviews included:

- instructional technology;
- library media, telecommunications, and community education;
- curriculum and assessment;
- reporting and accountability;
- professional development; and
- consortium partnerships.

Key Stakeholder Interviews

Approximately one-hour interviews were conducted with nine individuals representing wide interests in Wisconsin education. These interviews allowed further identification and understanding of each individual's perceptions and priorities regarding the implementation and use of technology to support education. The questions and responses are summarized in appendix A. Those interviewed included:

- Alberta Darling, state senator, Joint Committee on Education co-chair;
- Bob Wood, policy advisor on education to the governor;
- Marlin Schneider, state representative;
- Todd Penske, executive director, Educational Technology Board (ETB), Wisconsin Advanced Telecommunications Foundation (WATF);
- Vicki Poole, School to Work director, Department of Industry, Labor, and Human Relations (DILHR);

- Jim Morgan, vice president of educational programs, Wisconsin Manufacturers and Commerce (WMC);
- Mary Panzer, state senator, Joint Information Policy Committee co-chair; and
- Steve Nass, state representative, Joint Information Policy Committee co-chair.

Document Review

The technology task force researched many relevant technology-oriented documents produced by the DPI, the Wisconsin Educational Communications Board, regional educational centers, higher education, governor-appointed task forces, school districts, and other stakeholder organizations. See the reference section in appendix B for a list of related documents used in the study. This appendix includes references for footnotes throughout the text. In addition, the task force reviewed national research findings and educational technology studies conducted by several other states.

Technology Task Force Meetings

This plan reflects the planning and review activities of the technology task force, which met monthly to address important updates of technology initiatives around Wisconsin and the United States. In developing *The Wisconsin Educational Technology Plan PK-12*, the task force reviewed other states' technology initiatives, planning strategies, and approaches. The group visited model technology sites around Wisconsin. Many qualified educators shared their insights and experiences using technology to advance the teaching, learning, and management functions at their respective organizations or educational agencies during monthly meetings. Members were encouraged by the good will and common ground that enabled the development of *The Wisconsin Educational Technology Plan PK-12*. The plan clearly represents a consensus of educators, technicians, and other citizens.

3. State Technology Planning

The technology planning recommendations presented here list the main components identified by the Wisconsin Technology Task Force as requirements of a comprehensive statewide educational technology plan. The components resulted from the qualitative and quantitative research described in section 2. These core elements must be addressed to ensure successful development and implementation of appropriate educational technology systems.

3.1 Statewide Communications Network Design Principles

"I am also asking the Educational Technology Board and the Wisconsin Advanced Telecommunications Foundation to make sure that at least half of all Wisconsin public high schools are on the Internet by this fall, with the remainder online by the fall of 1997."
— Governor Tommy Thompson, 1996 State-of-the-State Address

The technology task force expects the state to provide leadership and guidance by articulating the vision of educational technology systems, providing the statewide technology infrastructure, setting priorities for implementation, and aligning the resources necessary to support development of the infrastructure.

At the school district level, leaders need to review their educational programs in light of educational reforms; local, state, and national standards; and the need for appropriate learning and instructional management technologies. To receive federal and state instructional technology funds, each district must develop a technology plan that integrates technology into curriculum. District plans must address the impact of technology on student learning and equitable access to resources. Plans must also detail hardware, software, local infrastructure, staffing, professional development, program operation, and maintenance. This must also include museums, public libraries, and post-secondary and community education. Envisioning and planning for enhanced educational technology resources is critical at all levels.

3.1.1 Voice, Video, and Data Networks

The state needs to focus on network standards and plans to ensure development of a statewide infrastructure consistent and compatible with district efforts and to allow access to information across the state, nation, and world.

Many methods exist to connect classrooms to district, state, national, and international networks. Applications requiring interconnectivity include:

- distance education;
- Internet access;
- teleconferencing; and
- telephone.

All schools must be equipped for voice, video, and data communications and for connection with external networks and resources as appropriate.

3.1.2 Affordable Access

The state should continue to pursue methods for making technology systems accessible and affordable throughout Wisconsin. Current models include:

- State Telephone Service (STS)—statewide voice network used by many of Wisconsin's public entities;
- WiscNet and BadgerDial Data Services—subsidized statewide Internet service provided to educational institutions and public entities;

- BadgerNet—Wisconsin's next generation of voice, video, and data network currently under development;
- University of Wisconsin (UW)-Extension Interactive Communication System—includes the Educational Teleconference Network and telephone conferencing, audiographics services, and compressed video;
- UW-Extension Statewide Satellite Service—educational and community programming service provider with downlinks at each county courthouse in Wisconsin; and
- satellite conferencing capabilities in each technical college district.

3.1.3 Regulatory Concerns

The state should continue to plan and pursue regulations that will facilitate the construction, operation, and interconnection of affordable statewide networks. *Convergence, Competition, Cooperation: The Report of the Governor's Blue Ribbon Telecommunications Infrastructure Task Force* makes six major recommendations to address this:

- develop a new regulatory model to manage the transition to a competitive telecommunications marketplace;
- protect access to affordable, high-quality basic telecommunications services for all Wisconsin residents;
- establish taxation policies that are equitable between the telecommunications industries and other industries and within Wisconsin's telecommunications industries;
- eliminate government laws, policies, and practices that create inadvertent barriers to telecommunications use;
- encourage the deployment of an advanced telecommunications infrastructure throughout the state; and
- provide incentive funding, planning, implementation, evaluation, and user-training support to programs that use cost-effective telecommunications solutions for education, health, public safety, and other needs.

3.2 Curriculum and Assessment

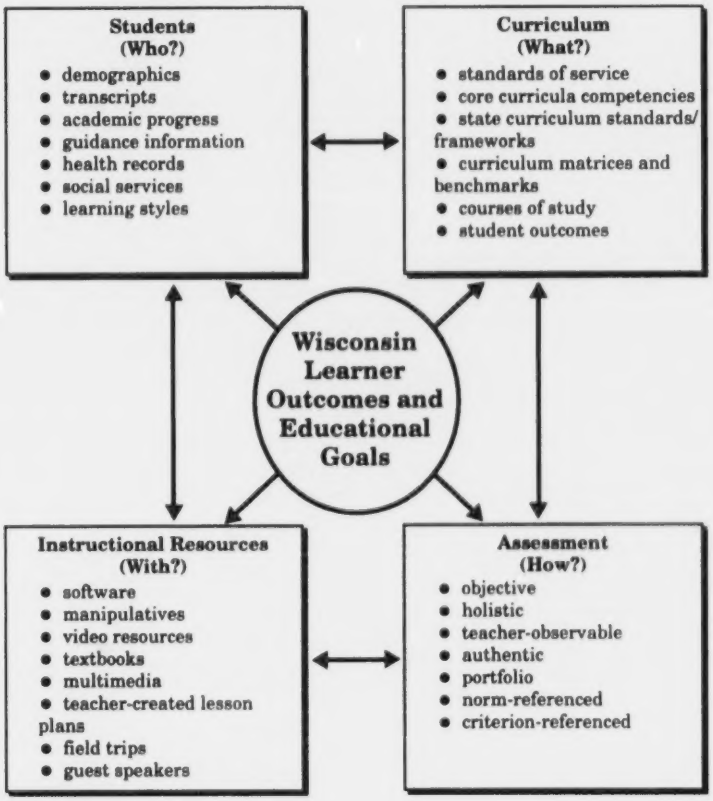
Using teacher-managed curriculum development/instructional management software systems to align curricula with instructional resources, assessment, and student information is important. Figure 2 represents how key elements need to be linked (i.e., students, curriculum, instructional resources, and assessments) so teachers can more accurately plan and monitor individual student performance. Teachers can identify the instructional resources (e.g., electronic, print, other) that will be most effective in curriculum integration. Teachers can determine how success will be observed or measured with various assessments. By electronically linking curriculum, learning, and assessment with student information, these technology tools provide the comprehensive information necessary to improve the educational process for Wisconsin students on an individualized basis. This will facilitate the orderly and integrated flow of large quantities of information that affects teaching, learning, educational management, and decision-making at all levels.

Wisconsin educators must articulate and identify learning goals as they relate to selected *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals* with access to these technology tools. This allows matching instructional resources (e.g., software, video, manipulatives, text, etc.) to teaching processes and strategies that will lead to student achievement of each goal. All forms of student assessment (i.e., standardized, state, school, and classroom tests) can be correlated to goals.

Greater accountability for the student, teacher, parent, school, and community will result from this structure.

Figure 2

Linking Elements So Teachers Can More Accurately Monitor Student Performance



The following resources must be in place to serve as a foundation for building-integrated curricula:

- time for planning, sharing, and staff development;
- necessary funding at the national, state, regional, and local levels; and
- guidance and support during the ongoing change process.

The roles and responsibilities for supportive agencies at various levels are highlighted below.

At the national level:

- vision;
- recommendations;
- leadership (e.g., National Council of Teachers of Mathematics, International Society for Technology Education); and
- funding.

At the state level:

- vision;
- leadership;
- coordination;
- dissemination;

- articulation; and
- funding.

At the regional level:

- vision;
- support;
- training;
- coordination (e.g., consortiums, cooperative educational service agencies); and
- funding.

At the district level:

- vision;
- management;
- staff development;
- curriculum and assessment design;
- funding;
- coordination; and
- implementation.

At the classroom level:

- vision;
- planning;
- implementation;
- facilitation;
- delivery; and
- assessment.

At the community level:

- vision;
- active participation;
- support; and
- additional resources (e.g., volunteering, fund raising, partnership, advising).

3.2.1 Wisconsin Learner Outcomes *and* Wisconsin's Educational Goals

The integration and use of technology will facilitate the accomplishment of the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*. The Wisconsin Department of Public Instruction (DPI) endorses the following learner outcomes, which were developed by hundreds of educators and other community members from throughout the state:

- identify, develop, evaluate, and apply criteria to ideas, products, and performances of oneself or others;
- revise a product, performance, system, and idea in response to relevant information;
- make informed decisions by examining options and anticipating consequences of actions;
- achieve desired results by interpreting and executing instructions, plans, models, and diagrams;
- recognize and devise systems and describe their interdependence;
- create a quality product, process, and performance to meet a need;
- respond to the aesthetic and intellectual aspects of an event, performance, or product;
- transfer learning from one context to another;
- recognize, define, and solve a problem;
- recognize and communicate one's strategies for accomplishing objectives;
- work effectively in groups to accomplish a goal;
- defend a position by combining information from multiple sources;
- develop and test a hypothesis;

- recognize when a need for specific information exists and demonstrate the ability to locate, evaluate, and use the relevant information;
- conceive of places, times, and conditions different from one's own;
- identify personal interests and goals and pursue them; and
- recognize the influence of diverse cultural perspectives on human thought and behavior.

The *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals* stress the application of academic knowledge. Each outcome identifies an important and complex act that requires students to use knowledge from various subject areas, thinking processes, and communication procedures. The outcomes are not tied to any specific grade level or to any specific subject area. Rather, they represent academic skills for which lifelong learners should aim. See appendix C for a more complete description of *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*.

3.2.2 Implementation Strategies

Technological tools can enable educators to develop and align curriculum, learning, and assessment. The following recommendations will assist Wisconsin in developing, integrating, and distributing curriculum information:

- conduct an analysis of curriculum development and instructional management needs at the school, district, and state levels;
- evaluate existing curriculum development and instructional management software applications; and
- create a source for locating and acquiring appropriate software to meet Wisconsin's curriculum development and instructional management needs.

3.3 Technology for Lifelong Learning

"In a world redrawn by NAFTA (North American Free Trade Agreement) and GATT (General Agreement on Tariffs and Trade), where factors of intellect and innovation dictate our competitive edge, understanding technology is essential. It is the difference between winning and losing. And, with at least 60 percent of all U.S. jobs requiring proficiency in sophisticated technologies by the year 2000, now is the time to act."
— David Byre, education publicity manager of the Software Publishers Association

Wisconsin is responsible through its schools to prepare all students for the challenges they will face in a highly technological society. Technology will become increasingly pervasive as the tool to manipulate text, numbers, graphics, and video. Students must master these tools. Not long ago, computers in schools were dedicated solely to teaching programming skills. Now many applications exist and continue to make their way into mainstream instructional practice. The basis for using technology in Wisconsin schools must be to promote various types of learning, including:

- inquiry-based;
- interactive;
- student-directed;
- lifelong;
- meaningful/relevant/real-world; and
- objective-based.

The use of a wide array of technology tools and applications in the classroom will enable teachers to create learning environments that allow students to:

- become responsible for their own learning;
- focus on identified learner goals;
- engage in cooperative work efforts;
- apply learning to real-life situations and experiences;
- enhance critical-thinking, problem-solving, and decision-making skills; and
- demonstrate progress toward meeting educational goals.

Wisconsin students must become proficient processors of information, developing the ability to:

- access and evaluate information from diverse sources;
- analyze numerical, textual, and visual data; and
- communicate their findings to a variety of audiences.

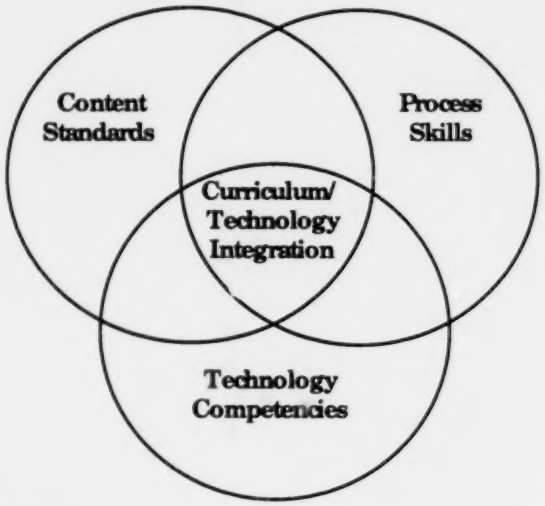
Students must develop the skills to become lifelong, engaged learners for individual success and for the economic stability and development of the community. This requires the interweaving of content objectives, process skills, and technology competencies at all levels of instruction. The creation of lifelong learners also demands that teaching and learning with technology occur in the same equitable and accessible manner.

3.3.1 Integrating Technology into the Curriculum

The integration of technology into the curriculum can best be described as the alignment of content standards, process skills, and technology competencies so that students and teachers learn about technology by teaching and learning with technology. Technology competency milestones provide the direction for infusing technology tools and resources into appropriate curriculum areas. (Figure 3) While technology can be integrated into a single discipline, many teachers follow the multidisciplinary and integration approaches. Two sample models, the multidisciplinary and integrated unit plans, can assist with the curriculum/technology integration process by ensuring equity and access to fundamental technology competencies. Descriptions of these models follow, with specific examples in appendices D and E respectively.

Figure 3

Curriculum/Technology Integration Approach



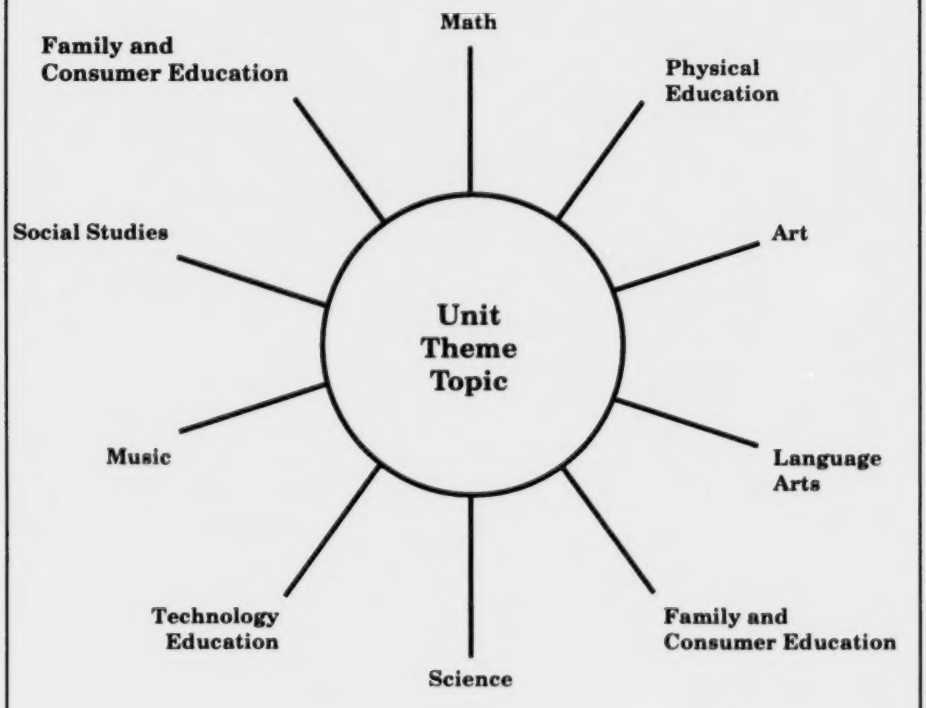
Multidisciplinary Unit Plan

The multidisciplinary unit plan targets content objectives, process skills, and technology competencies simultaneously within specific subject areas. The skills the student learns can be applied in other disciplines. The sample multidisciplinary unit plan, found in appendix D, uses a database structure in science to further the study

of chemical elements and to provide practice organizing and analyzing large amounts of information. This lesson allows students to assume the roles of scientists and, using an electronic database, to examine this information in many ways. Database development and manipulation concurrently address the various content objectives, process skills, and technology competencies listed within the multidisciplinary unit plan. Individual multidisciplinary unit plans will serve as maps for the development of curriculum packages that guide daily instruction in Wisconsin schools. Figure 4 illustrates how the selected unit theme topic remains the central focus, supported by traditional subject areas.

Figure 4

Multidisciplinary Unit Plan Design Model



From *Connecting the Curriculum Project* (1996)

Integrated Unit Plan

An integrated unit plan presents a less traditional approach to infusing technology into the curriculum and constructs thematic units by drawing on content from many disciplines without identifying separate subjects. The content is interwoven with and supported by a variety of educational technologies. Appendix E offers examples of the integrated approach for elementary, middle, and high school.

Elementary

The elementary unit entitled *Garden Celebration* integrates the concepts of health and nutrition, environmental awareness, seasons and weather, cycles and change, cause and effect, and personal responsibility. Using a variety of technology and non-

technology resources, students engage in many hands-on experiences to embrace target concepts. These experiences include field trips, planting, charting, plays, and illustrations.

Middle

The middle school unit, *Global Awareness: A Multicultural Unit on Human Rights*, heightens students' awareness, understanding, and appreciation of world cultures. Teachers involved in special projects, district specialists, and exceptional education staff helped design this unit. The unit integrates specific subject areas by focusing on respect and peace among world cultures, with the understanding that peace begins with each individual. Students use research tools, including telecommunications, field trips, guest speakers, and literary analysis to assist designing a class matrix to analyze human rights.

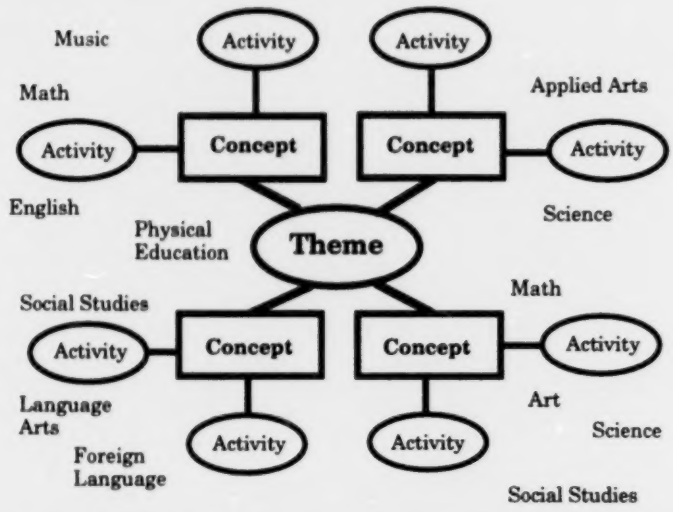
High

Global Environments links global awareness with environmental issues from economic, sociologic, and biologic perspectives. High school students use technology resources to conduct scientific studies on topics such as acid rain and global warming. They will share results with other researchers locally and globally via telecommunications.

The design of the integrated unit plan is not intended for all activities or technology resources listed in the appendix, but rather to provide a thematic context with an extensive list of options from which educators can choose. Figure 5 illustrates how theme, concept, or topic is supported by learning activities that rely on acquiring subject skills and knowledge to complete the activity rather than being subject-specific.

Figure 5

Integrated Unit Plan Design Model



Students show mastery of school subjects through application and/or performance in a context. From *Connecting the Curriculum Project* (1996).

Over time, the successful alignment of curriculum and technology brings about observable changes in teaching and learning environments. Categorized by *Technology and Learning* authors Odvard Egil Dyrli and Daniel E. Kinnaman, the impact of technology integration on the curricula will occur in three progressive levels:

- enhancing and enriching existing curricula using technology within the confines of existing school structures and schedules;
- extending existing curricula with technology by providing opportunities beyond the limitations of school structures and schedules without serious disruption; and
- transforming classroom curricula through technology in ways that may require new paradigms, changes in organizational structures, and innovative schedules.

3.3.2 *Developmentally Appropriate Instructional Technologies Across the PK-12 Curriculum and Beyond*

Curriculum and technology will play an unquestionably crucial role in the futures of individual students and our world. Experts from many disciplines advise that technology should play an important role in curriculum planning, development, delivery, assessment, and administration. This section offers a discussion of problem-solving and critical-thinking skills necessary for all students. Appendix F provides a description of developmental levels (i.e., elementary, middle school, high school, and adult learning) with a narrative about the way technology facilitates developmentally appropriate learning in various content areas.

Problem-Solving

Because of the unique qualities inherent in educational technologies, all learners can be effectively presented with opportunities to solve problems requiring the integration of higher-level thinking skills. These include:

- defining the problem;
- expressing problems clearly and succinctly;
- distinguishing between fact and opinion;
- using logical reasoning (deductive/inductive);
- using creative thinking (originality, fluency, flexibility, elaboration);
- making decisions;
- eliminating unnecessary choices;
- determining desired outcomes;
- searching for viable solutions;
- evaluating outcomes;
- revising and repeating the process as needed; and
- evaluating sources when assessing data.

Characteristics of Problem-Solving Software

Characteristics of software contributing to the development of problem-solving skills may include:

- interactivity;
- open-ended branching;
- simulated learning situations;
- responsiveness;
- user-managed options;
- high degree of motivation and engagement;
- clear explanation of the problem;
- numerous correct solutions;
- immediate and positive feedback; and
- options to retry, redevelop, and refine solutions.

Critical Thinking

One of the primary objectives is to help students learn to think more critically. At the center of this premise are the following hypotheses:

- All students are capable of higher-level thinking.
- Thinking skills

— can be taught;
— can be learned; and
— are essential to the learning process.

Having established these presumptions, critical thinking skills such as those listed below must be fostered:

- analyzing;
- identifying central issues;
- comparing and contrasting differences and similarities;
- classifying;
- extracting relevant information;
- discriminating relevant from irrelevant data;
- inferring;
- translating;
- interpreting data;
- inducing;
- deducing;
- elaborating;
- generalizing;
- prioritizing;
- patterning;
- checking consistency;
- identifying cause and effect;
- recognizing assumptions;
- identifying clichés, bias, propaganda, and slanting;
- selecting reasonable alternatives;
- testing hypotheses and conclusions;
- predicting outcomes;
- defending intellectual arguments, constructing support; and
- appreciating the views of others.

Technology Issues Related to Problem-Solving and Critical Thinking

Combining effective instructional strategies and teaching methods, educational technologies can provide rich opportunities for the development of critical thinking skills. The following questions must be addressed and answered to ensure their positive impact in the curriculum.

- Is there a commitment to secure resources necessary to support the use of technology in the thinking curricula?
- Do goals established for computer use promote intelligent thinking?
- Do mechanisms in place support the use of technology in the curriculum?
- Is the process of thinking defined?
- How is software evaluated and integrated into the curriculum?
- Is the implementation of technology in the education environment being evaluated?
- Are teachers trained in using technology?
- Is technology the most effective means to promote thinking skills in a given situation?
- Is the community aware of instructional and technology goals?

3.4 Professional Development

"This world of rapidly changing technology offers unique teaching and learning opportunities as well as distinct challenges. Preparing teachers to use technology to its full advantage will take time and resources—without that commitment, our children will not truly be technology literate."

— State Superintendent of Public Instruction John T. Benson

Rapid change of staggering proportions within the field of technology necessitates a commitment to ongoing and sustained professional development opportunities. Wisconsin educators must keep pace with current technological trends and developments. Professional development facilitators in Wisconsin must be visionary in planning quality professional growth experiences. In turn, educators must be simultaneously challenged and supported to develop expertise with new technological innovations.

"Professional development" refers to continually updating, broadening, or developing an individual's capacity and skills requisite for competence and productivity on the job. Professional development is essential to implementing a successful technology system.

Professional development is frequently the vehicle used to:

- further broaden knowledge, skills, and attitudes;
- persuade people to accept large-scale systemic change and paradigm shifts;
- modify educators' perceptions and learning styles; and
- support and encourage teachers as they make changes.

Reform initiatives in the 1990s emphasize technology as a key component of education. Technology will continue to play a more prominent role with respect to:

- teaching and learning processes;
- development of higher-level thinking skills;
- presentation of information;
- communication of information;
- student information systems;
- assessment and evaluation; and
- instructional management.

Professional development opportunities distinguished by their focus and intended outcome are critical for educators. Professional development provides educators with strategies for future technology interaction and helps them refine their technology skills.

3.4.1 Preservice Preparation

In addition to providing appropriate technology inservice to education professionals in the field, changes must occur in the manner in which future teachers are prepared. Post-secondary institutions with education programs must model appropriate uses of technology in the classroom. Future Wisconsin teachers must enter their respective fields equipped with a wide variety of technology skills and experience. Greater collaborative efforts between school systems and teacher training institutes must be established so that student teaching experiences take place in a learning environment utilizing instructional technology. Future teachers must observe and intern with educators proficient in demonstrating appropriate and diverse uses of technology. The importance of the uses of technology at the collegiate level must be emphasized and integrated across the college curriculum.

Competencies for Educators

Technology competencies for all members of the greater educational community within Wisconsin will vary and must be articulated for each group. Personnel at all levels of the school system must possess some basic skills, knowledge, and positive attitudes toward technology use to pursue the educational goals of the district and school. However, not all educators need to acquire the same levels of knowledge and expertise to carry out the responsibilities associated with their respective positions

or job descriptions. Some educators benefit from a general awareness of the capabilities associated with a given technology or related technology issue or concern. Others need to attain considerable mastery to oversee the management and operation of technology. Benchmarks of technology competence for Wisconsin educators must be established to design effective training and educational activities. Appendix G contains a matrix identifying suggested levels of competence for different educational roles.

International Society for Technology Education Accreditation Standards

Teacher preparation programs are just beginning to formalize guidelines to measure their ability to arm graduates with basic technology skills and competencies. The International Society for Technology in Education (ISTE) developed the most compelling recommendations for technology foundation standards for all teachers. These standards (listed in appendix H) are fundamental concepts and skills that educators need. Many states adopted ISTE's accreditation model standards, as did the National Council for Accreditation of Teacher Education (NCATE) in 1992. The Wisconsin chapter of ISTE (WISTE) promotes these principles and standards.

Computer-related technology can improve the content of the curriculum and the instructional delivery system in Wisconsin. ISTE believes students and teachers must use computer-related technology routinely if students are to be prepared adequately for citizenship in the information age.

3.4.2 Continuing Professional Development

Inservice for curriculum and technology integration will provide timely professional development opportunities ultimately resulting in enhanced student learning. Multiple levels and areas of professional development must be targeted so Wisconsin teachers and administrators feel empowered to use technology in the context of their own productivity. Professional development for integrating technology into curriculum should be an ongoing process. Many sources should offer continuing education, including universities, technical colleges, cooperative educational service agencies (CESAs), professional associations, and local districts. Educators must take advantage of courses, workshops, and conferences to learn productivity tools and instructional technology appropriate to each of their needs. These tools and technologies should enhance student learning.

Several technology-based applications should be included in a holistic professional growth program, such as:

- schoolwide networking applications
  - local-area network (LAN)
  - wide-area network (WAN)
  - security procedures
- creativity applications
  - painting and drawing
  - graphics
  - thought generators
  - music generators
- personal management applications
  - calendar management
  - scheduling
  - project management
  - outlining software
- telecommunications
  - e-mail
  - electronic conferencing
  - interactive video

— distance learning (one- and two-way)
— interactive television
— bulletin boards, list servers
— Internet and online services
• presentation applications
— videos (tapes and laser)
— presentation software
— hypermedia
— multimedia
— projection capacity
• productivity applications
— word-processing
— database
— spreadsheet
— utilities
• research applications
— electronic encyclopedia
— databases (online and CD-ROM)
— visual archives
— ocal and remote library access
— global networks

Wisconsin educators who master a variety of technology applications will be more confident of their abilities to respond to students' instructional needs. They will be better prepared to serve as facilitators of learning rather than as mere content providers. Therefore, planning and preparing a comprehensive professional development program in Wisconsin is integral to effectively using technology to support curriculum goals and outcomes.

3.4.3 Delivery Models

A key element inherent in the design of effective professional development in Wisconsin is a multifaceted approach to its implementation. Educators must capitalize on available resources to enhance their professional development—effectively *using* technology to *learn* technology. Equally critical is sharing effective technology-infused integration practices with colleagues. By taking advantage of available technologies, Wisconsin educators will be able to utilize telecommunications, distance learning, field-based graduate degree programs, videotape training and independent study modules, project-based learning activities, and summer institutes as effective delivery modes for professional development.

A significant number of Wisconsin PK-12 professional educators still function at the nonuser-to-novice level. Relying solely upon hands-on training workshops as the primary means of professional development is likely to delay mastering technology. By utilizing the technology itself as a tool to teach about technology, a variety of learning experiences become feasible. The view of professional development in Wisconsin must expand beyond traditional delivery styles. Methods of offering professional development opportunities are delineated below.

Hands-on Training Workshops

The traditional form of technology-oriented professional development is the hands-on training workshop. Typically, participants assemble in a school or district computer lab to acquire specific skills to operate software. After receiving basic information, participants are encouraged to expand upon initial training independently or through guided follow-up opportunities.

Hands-on workshops prove very effective when they are conducted at a designated training site or location in a given school district and designed and developed

around the software available in the district. Educators are able to learn in a familiar environment alongside their peers. Teachers are able to identify key individuals within their schools or districts to assist them if problems or questions surface.

Telecommunications

Telecommunications media enable Wisconsin educators and students to remove the barriers of time and space, giving them round-the-clock communication capabilities. New developments in telecommunications can provide educational opportunities not previously available to the community, educators, and students by allowing interaction with subject-area experts from around the world. Using computers, modems, and telephone lines, Wisconsin educators can experience new media within the context of personalized interactions and activities, thus enabling the technology to become an invisible dimension within the learning environment.

Distance Learning

Distance learning, the use of live video, voice, and data transmitted via various technologies, became increasingly more common during the last several years. It can be used to teach many different subjects and courses at the high school and college levels. In addition, distance learning offers prime opportunities to deliver staff development experiences relative to an assortment of topics, including the effective use of technology.

Teleconferencing can be a very cost-effective solution to addressing the professional development needs of teachers. Teleconferencing, the communication and discussion of specific topics, occurs when two or more remote parties are linked via telephone, satellite, or cable access.

Using resources available from Wisconsin's 20 instructional television fixed service systems, regional fiber optic networks, and 21 regional distance learning education consortia, a great deal of professional development programming can be delivered throughout the state. This type of delivery can reach large numbers of teachers while minimizing extensive travel.

Field-Based Graduate Degree Programs

Field-based graduate degree programs constitute an effective means of enriching professional development and positively affecting Wisconsin PK-12 education professionals. This is also a viable option for graduate students seeking to improve their knowledge and experiences and for college or university faculty overseeing collaborative efforts. Educators can observe current trends and research recommended for technology integration. A Wisconsin graduate student in a field-based program can apply the instructional strategies and techniques in a practical and realistic learning environment. College and university faculty members benefit from witnessing the application of technology within the PK-12 classroom and evaluating its impact. Distance learning resources can deliver at least part of graduate degree course work.

Institutes

Institutes offer an excellent means for focusing in depth upon specific technology-based Wisconsin professional development goals and outcomes. PK-12 educators often lack the time to address their technology professional development needs due to the demands and responsibilities of their jobs during the traditional school year. Research literature is replete with accounts of inadequate time to learn about technology. Capitalizing upon available time during the summer is an excellent strategy for bringing together groups of Wisconsin teachers, administrators, and support staff to explore higher levels of technology awareness and use.

Project-Based Learning

Individuals or cooperative groups of educators can focus on a project-based learning activity. Similar to an independent course of study, project-based learning is best suited for educators who successfully master core technology competencies. Participants must demonstrate self-determination and strong management skills as they work toward accomplishing identified objectives and outcomes.

Models/Preview Centers

The Collaborative Learning Center (also known as Classroom 2000) at the UW-Stevens Point established an effective "partnership with change" in the educational community. This model is directed squarely toward the improvement of the teaching/learning process throughout the school community. Educators from around the state can visit the facility, a relatively low-cost, well-integrated high technology classroom. In addition, educators can evaluate the center's large collection of K-12 learning software.

Several other preview sites exist throughout Wisconsin. One is the Wisconsin Instructional Technology Resource Center, a collaborative effort between the UW-Whitewater and CESA 2, which is housed at the university. Another preview center exists at the UW-Madison School of Education Instructional Materials Center, the only one of these three that circulates software so teachers may try it with students.

The 12 CESAs and their services and technology staffs are additional resources. Some CESAs feature extensive preview centers and software lending libraries. See appendix I for information about the CESA Instructional Technology Service Council.

3.4.4 Characteristics of Effective Professional Development

Recent history indicates that technology planning must include comprehensive and continuous professional development to be successful. Professional literature identifies several characteristics of effective district-level professional development applicable to technology training (Joyce and Showers 1988; Sparks and Loucks-Horsely 1989; Ward 1989). These studies indicate that the following strategies will promote effective professional development in technology:

- conduct professional development in school settings;
- link activities and programs with other district-wide efforts;
- encourage teachers and administrators to plan together;
- focus on all educators, not just a small cadre of technology enthusiasts who dominate the local field of technology;
- emphasize self-instruction;
- make available an assortment of technology-based opportunities (e.g., awareness, demonstration, practice, feedback, and coaching activities);
- facilitate concrete, hands-on, and sustained professional development;
- provide opportunities for follow-up support to teachers and administrators;
- budget for professional development on an annual basis;
- recognize and plan for stratification of skills and competencies, dictating a need for diverse technology offerings to accommodate varying levels of technology sophistication;
- support creative and multiple scheduling options (e.g., after-school workshops, weekends, release time, inservice days, summer workshops, evenings, independent study);
- offer access to appropriate hardware and software so that training and professional development learning activities can be conveniently practiced; and
- allot time to develop and refine newly acquired skills.

3.4.5 Certification Issues

Teacher Certification

The basic requirements for initial Wisconsin teacher certification have not kept pace with the acceptance and adoption of technology within the field. As a result, most newly certified teachers do not possess the necessary technology skills. The core requirements for teacher training programs are at the center of debate. Wisconsin must improve these training programs by:

- providing the necessary financial and technology resources and directing the higher education community to ensure that newly certified teachers enter the classroom with appropriate technological skills;
- assisting school districts in creating coherence among professional development plans;
- linking professional development in technology to recertification; and
- linking schools, districts, and individuals with higher education, private service providers, and other resources for professional development.

Paramount to establishing guidelines is providing flexibility and diversity of learning experiences. These activities must be consistent with the definition and characteristics of effective professional development and may take the form of:

- formal course work at a college/university campus, technical college, or on-site in schools;
- visitations to pilot sites and exemplary programs;
- mentoring, collegial sharing, or train-the-trainer models;
- release time to learn new skills;
- attendance at national, state, and regional conventions/conferences;
- workshops, seminars, conferences (with participation in follow-up activities);
- peer coaching or other substantial professional development support to colleagues;
- action research projects in school;
- service to the education profession at the regional, state, or national levels with advisory/working groups or organizations such as Wisconsin Educational Media Association (WEMA) and WISTE;
- service to the school district by working on curriculum and/or evaluation committees;
- writing/publishing (e.g., papers, articles, or books); and
- dissemination of "best practices."

While teachers should be competent in technology before they reach the classroom, changes in teacher education programs, which are weak in technology, are very slow to evolve, as are changes in certification and recertification requirements. In addition, appropriate staff development opportunities to update practicing teachers in educational technology do not exist uniformly throughout the state. A giant step in the right direction is being taken with the proposed changes in district professional development planning that links professional growth and recertification.

District Technology Coordinator Certification

The position of district-level instructional computing technology coordinator in Wisconsin school districts is evolving, partly due to the increased use of instructional technology and partly because the *Wisconsin Educational Standards* (Wisconsin Statute 121.02(1)(k)) requires a sequential K-12 curriculum for computer literacy integrated into curriculum plans in other subject areas.

Some districts appoint teachers with full-time teaching loads for this district technology coordinator position. They have little time to work with teachers in their own building much less go to another building while school is in session. Still other teachers are assigned technology coordination responsibilities for a single year when the enrollment in their classes is insufficient to maintain a full-time position, with another teacher in a similar situation taking over the following year. Some districts

hire coordinators with high levels of technical skill but without educational certification or curriculum expertise.

The Wisconsin Technology Task Force endorses the recommendations put forth by the Computer Coordinator Certification Committee appointed by the state superintendent in 1993 to assess the need to certify district technology coordinators and to make recommendations. This committee proposed that district technology coordinators be certified and recommended a set of needed competencies for the position. The committee's proposal offered an alternate peer review method to obtain certification in addition to the current process of academic credit attainment and universities and colleges recommending individuals for specific licenses. In the peer review process, individuals seeking the district-level instructional computing technology coordinator certification would go through a committee review by their peers based on the required set of competencies. Appendix J describes the review process for certification for district technology coordinator.

3.5 Equity and Student Access

"Everyone should have equal access (to technology) at home and school."
— State Senator Mary Panzer

"With technology, we have an opportunity to shrink the gap between the haves and have-nots—to assist those struggling to break the vicious cycle of poverty by providing the knowledge and skills that will secure meaningful employment."
— State Superintendent of Public Instruction John T. Benson

Equity and access issues are central to any technology plan. Equity refers to the availability of instructional technology to all students regardless of socioeconomic status, culture, ability, religion, gender, age, or race. The state cannot make the results of technology equitable for all students, schools, and districts. The state can, however, lay the groundwork for equity across all districts by providing funding for a common base of technology.

Access refers to students' abilities to use instructional technologies to enhance and support learning about and with technology. Access is linked to three important variables:

- the number of computers (generally evaluated in terms of a student-to-computer ratio) and supporting infrastructure;
- the location, configuration, and scheduling of technology resources; and
- the presence and use of networking and/or telecommunications to transcend classroom and school geographical boundaries.

3.5.1 Acquisition and Management

The acquisition and management of technology resources address access and equity issues. Acquisition deals with the funding approaches and decision-making processes by which schools acquire instructional technology resources. Effective management includes a well-developed inventory process to help identify problems with equitable distribution of equipment within a district.

The efficient acquisition and management of technology resources will help to ensure that:

- schools purchase equipment that meets or exceeds accepted standards;
- needs are addressed for persons with disabilities (e.g., table height, turn-around space, devices to assist and adapt, etc.);
- all students, teachers, and administrators have access to current, appropriate, and abundant information resources;
- existing resources are used to their maximum potential, with future dollars spent in areas of greatest need; and
- all schools attain a sufficient infusion of instructional technologies to meet district goals through local implementation.

The success of the Wisconsin educational technology plan to achieve measurable gains in student performance depends on sufficient infusion of technology, accompanying training, and ongoing maintenance, replacement, and support. Reaching critical mass in technology resources for district schools means that, within the immediate future, the following goals must be achieved:

- The ratio of students to contemporary instructional workstations will be no more than 5 to 1.
- Each classroom will have access to equipment to support video, voice, and data networks.
- Each district will have access to equipment for originating and receiving distance learning transmissions.
- Each district will install local- and wide-area networks with access to global networks.

3.5.2 *Increasing Access to Technology*

A 1993 survey on the status of technology in the United States (Bruder 1993) reported that the national student-to-computer ratio dropped to 16-to-1 from 26-to-1 in 1988 (as reported in the Office of Technology Assessment Report, *Power On! New Tools for Teaching and Learning*).

While the prevalence and availability of computer technology steadily increases, the actual amount of time the teacher or students use computer technology is minute. One computer in an average elementary classroom allows each student about 15 minutes of access each week. In addition, overall computer competency among teachers grows fractionally (Hannafin and Savenye, 1993). Factors contributing to this situation include:

- fear of failure;
- lack of experience;
- unfavorable school climate;
- frustration inherent in the learning process;
- competition for student attention; and
- lack of on-site technical support.

If Wisconsin educators are going to overcome barriers to training and professional development, they must have access to technology. Consistent availability, including portable computers for home use by educators and students, will enable them to explore software programs, establish a solid comfort level with respect to hardware and applications, and enable them to effectively integrate technology into the curriculum.

3.6 Information Management and Reporting System Design

Accountability, communications, distribution, and reporting applications are essential components of an educational technology system. They constitute an information management infrastructure that can improve the efficiency and effectiveness of the overall educational system.

The accountability and reporting system must be constructed using industry-accepted standards to enable the system to adapt to new technologies as they become available. Ease of use and flexibility are required to empower operational and policymaking personnel at all levels. In addition, users must be able to rely on the accountability and reporting system for timely and accurate information that allows them to make timely decisions and corrective measures.

3.6.1 *Design Principles*

The accountability and reporting system must be designed to serve the needs of all education personnel. It will be viewed differently at each operational level of the educational system as follows:

- Teachers are most concerned about accessing student assessment and instructional resource materials to adjust teaching strategies to individual student styles of learning and to evaluate how well students are meeting established local, state, and national standards.
- School building personnel are interested in information that will provide feedback on how well school improvement programs are working and how to better utilize the instructional resources.
- School district personnel need access to reliable, timely information to help building-level and teaching staffs meet their mission of providing quality education to all students.
- State agencies responsible for the public school system need a method for timely reporting of aggregate student, financial, and staff information.

These role perspectives should be used to guide the systemic development of accountability and reporting services.

3.6.2 *State-Level Implementation Strategies*

The Wisconsin accountability and reporting system must be designed to support the use of technology for improving the ways educators, instructional leaders, policy specialists, and those responsible for oversight carry out their work. The Wisconsin accountability and reporting system must be flexible enough to meet the needs of educators now and in the future. Specific recommendations to facilitate collecting data include the following:

- create a network to help manage the teaching and learning process;
- simplify the data collection process;
- measure results against local, state, and national goals; and
- disseminate educational materials, information, and assessment reports.

The major strategies for designing the accountability system are:

- develop a common set of technology terms that can be clearly understood at all educational levels (the glossary in appendix K can be a starting point);
- establish a standardized statewide student records system as recommended by the State Superintendent's Education Data Advisory Committee in November 1995 (appendix L); and
- fully implement the DPI database to collect and provide data on all school districts in Wisconsin. Known as an enterprise database, it is being developed to provide support for decisions made by policymakers and operating personnel.

Communications will be significantly enhanced at all educational levels by sharing a compatible set of applications that should, at minimum, include:

- messaging or electronic mail;
- electronic conferencing;
- group document handling;
- project management; and
- customized educational applications.

Distribution systems serving classrooms, schools, districts, and regional and state departments should include:

- books and periodicals on-demand;
- curriculum resources;
- educational research;
- electronic news feeds;
- instructional resources on-demand;

- instructional software;
- multimedia instructional materials; and
- video resources.

The statewide reporting system must improve the usefulness, quality, and timeliness of reported information to enable users at all levels to:

- select from a menu of forms to generate commonly used reports and analyses, customizable by a variety of data selection criteria;
- enter operational data using electronic forms that are self-editing and self-routing, with procedures for automatic database loading; and
- use statewide adjunct reporting systems designed to interface with school and district operational applications to capture data automatically for statewide reports.

The statewide reporting system must be structured to minimize the cost to local districts:

- All government agency requests for required data should be fulfilled by the PK-12 school districts.
- For specific requests that require unique data, the requesting agency should provide the software and hardware to gather and report that data.
- The requesting agency should make efforts to assure requested data are not available at another state or county governmental agency.

3.6.3 District-Level Implementation Strategies

Technology planning initiatives at the district level will focus on the selection and implementation of a consistent base of central office management applications. These applications will enhance communications among schools within the district and the district office. District-level applications must be able to accommodate unique situations.

The selection and purchase of administrative technology applications should be based on the following goals:

- accountability for student achievement;
- productivity;
- improved management;
- expanded communication;
- enhanced decision-making;
- personnel evaluation; and
- security maintenance.

3.6.4 Administrative Technology Utilization

To provide the leadership necessary within their buildings and districts, administrators must adopt and use technology for their own purposes and as a model for staff members. For example, district and building administrators frequently need answers to similar questions. Administrators must use desktop technology, authorization, and training to use district and state enterprise databases for decision support.

3.7 Learning Environments

The learning environments in Wisconsin schools will greatly affect the kinds of teaching and learning that will take place. To ensure that technology-rich learning environments are available to all students in Wisconsin, key issues must be addressed at the state, district, and school levels. Facilities standards must be formulated to ensure equity, cost-effectiveness, and interoperability. Maintenance and ongoing procurement must be planned to support a variety of alternative learning environments.

3.7.1 *Roles and Responsibilities*

The DPI must work with other state agencies and businesses in designing and upgrading school facilities. This role should focus on providing support to students, educators, schools, and districts by:

- setting appropriate standards for facilities to ensure interoperability and equity;
- leveraging and brokering existing expertise within the state; and
- developing district and regional capacity in facility design.

The successful identification of instructional and administrative technology solutions must involve technology planning at the school, district, regional, and state levels. At the school level, curriculum decisions should be the driving force behind the selection and purchase of instructional technology solutions. Technology integration can help to foster lifelong learning; the ability to access, analyze, and communicate information; and responsible societal membership. Ultimately, the integration of technology into classroom learning environments must support a school's mission to provide quality education for all students. To accomplish this, schools and districts must:

- base technology plans on educational and organizational goals;
- link technology facility work to other facility projects; and
- include technology requirements in construction planning.

Districts and schools should remain in control of local decision-making regarding technology options that reflect the needs and goals of the community and the existing learning environment. School personnel will need to consider how to deploy appropriate resources (e.g., hardware, software, technology-proficient educators) to maximize the benefits of the entire technology system. The equitable distribution of technology resources throughout districts and schools will enable all students, teachers, and administrators to function more effectively.

3.7.2 *Design Criteria*

Linking specific learning environments to instructional activities involves aligning instructional reform efforts, developmental needs of the learner population, staff competencies, and specific technology applications (see appendixes F and G).

With the proper configuration of hardware, peripherals, and software, even a single computer in the classroom can achieve clearly defined results. Clusters or complete classrooms of computer systems are best for achieving initiatives with greater dependence on technology tools for implementation, management, and assessment. Educators need assistance from a variety of sources when choosing realistic and appropriate technology learning environments to address district needs and priorities. Distance learning can allow school systems to offer a greater range of high-quality curriculum to students, especially in rural areas of low population density.

Design criteria for learning environments include access to the following basic components:

- computer workstations;
- local-area networks (LANs);
- wide-area networks (WANs);
- Internet;
- community networks;
- regional networks; and
- statewide network.

A schoolwide network can provide all workstations connected to the network with uniform access to a wealth of information. Network technology can potentially supply links to other classrooms within the school and to other schools in the district, state, nation, and around the globe. Information available on CD-ROM disks can

ellite video can be distributed across the network. To achieve this, wiring standards supporting voice, video, and data must meet or exceed industry standards.

3.7.3 *School Facilities*

Wisconsin schools need buildings and school furnishings that support the technology-rich learning environments envisioned in this study. Bringing school facilities up to the level required by these ambitious goals will require a significant investment. Wisconsin must be sure that this investment is made wisely so that educational goals are met and investments are made based on a flexible, reliable, and safe design to ensure a long life and high return. Major needs that must be addressed in this process include:

- an adequate school technology infrastructure;
- a comprehensive infrastructure architecture meeting state standards to ensure interoperability;
- a process to ensure that instructional and organizational goals are met with appropriate technology environments; and
- continuing technology infrastructure upgrades tied with other facility improvements.

The school building represents one of the district's major investments. This investment must be protected, and a technology network infrastructure must be installed as cost-effectively as possible.

3.7.4 *Building Retrofit*

Implementation of a comprehensive upgrade of the technology infrastructures and environments in Wisconsin schools should be a joint effort at the local, regional, and state levels.

At the local level, the following strategies should be employed:

- review all school facility construction and renovation plans to address technology needs;
- employ a comprehensive technology planning process to identify facility needs and correlate them to curricular, instructional, and organizational goals; and
- address technology issues as part of the curriculum review process.

At the regional level, the following services should be offered:

- coordination of infrastructure planning; and
- expertise and leadership of local planning processes.

At the state level, the following activities should be addressed:

- recommend statewide standards and/or guidelines for:
  - technology for voice, video, and data communications;
  - heating, ventilation, and air conditioning (HVAC) requirements;
  - environmental issues;
  - electrical power;
  - furniture and space requirements;
  - accessibility;
  - lighting;
  - acoustics; and
  - video production elements.
- update Wisconsin's process to help fund school-building improvements to include technology in designs and budgets; and
- assist district technology planning efforts to ensure equity and generate information on statewide standards.

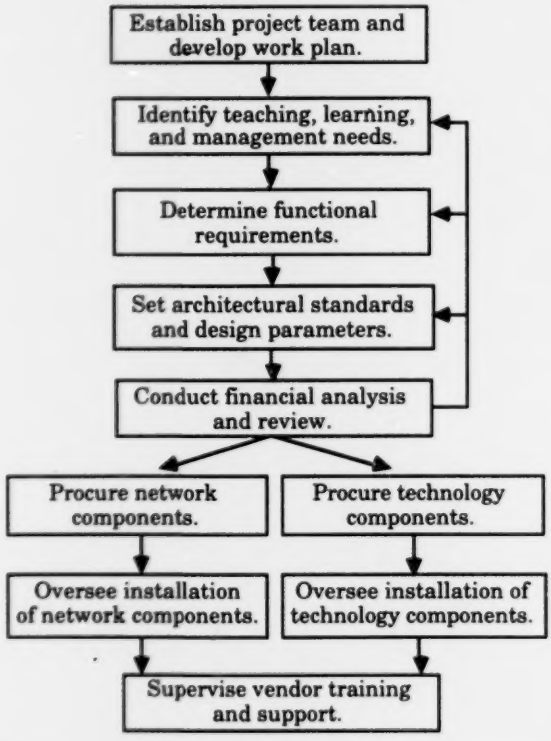
The combination of these strategies at the state, regional, and local levels will ensure an effective, equitable approach to education statewide.

3.7.5 *New Construction*

Wisconsin must develop a standard process for designing new and remodeling existing facilities. This process must ensure all stakeholders are involved at the proper stage and that responsibilities of all players on the building team are clearly understood. Well-designed forms, procedures, and software tools must support the process and facilitate communication among groups and ensure effective task execution. Figure 6 diagrams the recommended process.

Figure 6

Recommended Building Design Process


Establish project team and develop work plan.
Identify teaching, learning, and management needs.
Determine functional requirements.
Set architectural standards and design parameters.
Conduct financial analysis and review.
Procure network components.
Procure technology components.
Oversee installation of network components.
Oversee installation of technology components.
Supervise vendor training and support.

The design must address signal wiring as a whole, including wiring for voice, video, and data communications; energy management controls; sensors for heating, ventilation and air conditioning; and security. Only by addressing the wiring infrastructure as a whole can Wisconsin minimize infrastructure costs and increase its effectiveness. Drawings must be available in electronic form to facilitate ongoing maintenance of these systems.

3.7.6 *Regional and Community Learning Consortia*

Wisconsin should encourage the establishment of community consortia to develop strategies for assessing and meeting community network needs. Regional learning consortia can play a variety of roles to support effective learning environments. These might be to:

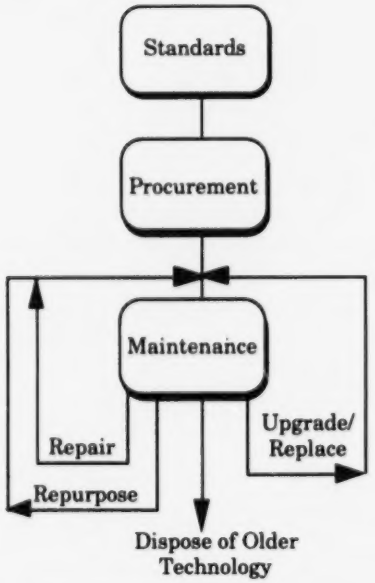
- share information on existing successful models of community networks such as Danenet, Omnifest, Chippewa Valley Freenet, DoorNet, and the Wisconsin River Freenet networks;
- arrange for the funding, construction, staffing, and operation of community learning centers; and
- ensure that all learning environments feature gateways to regional, statewide, national, and international resources.

3.8 Technology Standards, Procurement, and Maintenance

Educational technology follows a life cycle encompassing the development of technical standards, procurement of technology, and maintenance of that technology throughout its useful life (see Figure 7). To create the best educational outcomes and generate the highest level of return on investment, each step must be effectively addressed in a coherent manner.

Figure 7

Technology Life Cycle



Coordination and support of a consistent approach to standards setting and procurement at a statewide level is needed to achieve the following goals:

- interoperability;
- information exchange;
- commonality of training;
- equity; and
- timely and efficient procurement.

A statewide approach to procurement must meet the following requirements:

- conform with accepted modern procurement practices and procedures;
- provide alternatives to support district technology planning initiatives;
- provide the technical standards described in the technology plan;
- provide for expedited procurement procedures;

- minimize purchase costs;
- minimize personnel costs; and
- maintain flexibility.

The approach to standards-setting and procurement described in the following sections is designed to meet these potentially contradictory goals in a balanced manner.

3.8.1 Standards and Procurement

Many interconnectivity, support, and training issues can be eliminated by establishing a common set of standards for voice, video, and data transport and for networking equipment and software application platforms. Standardization must not limit student learning opportunities or school districts' abilities to apply educational technologies cost effectively.

Complete deployment of comprehensive standards will take many years, with components of the statewide system evolving over time. Many design decisions must be fluid, allowing users to take appropriate advantage of technology advances and price/performance improvements as they become available. At the same time, this process will have to be controlled carefully to maintain the integrity of the system as a whole, to ensure equity across all schools in the state, and to preserve earlier investments.

The state should convene a technology standards committee to track technology and product improvements and update the technology standards recommended in this document. Some decisions, such as recommended price and performance standards for various levels of systems, will need to be examined in a six-month cycle.

Table 1 shows the recommended major technology standards areas and the expected standards review cycle. Other decisions will need to be reevaluated annually. Still others, those affecting basic network infrastructure, for instance, should remain stable for at least two years. The technology standards committee should represent end-users, local and regional support organizations, the state, and representatives of other groups that may share the network, such as libraries and higher education. The committee should include a Department of Administration (DOA) representative.

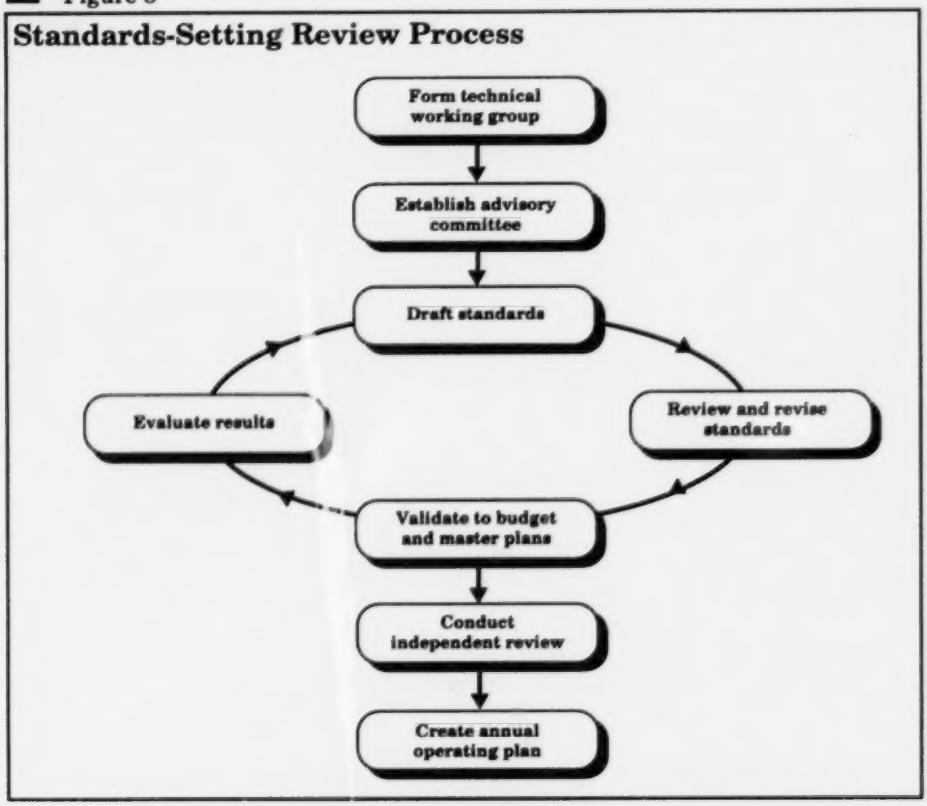
Table 1

Recommended Standards Review Cycles

Type of Standard	Review Frequency
network protocols	2 years
network transmission	2 years
workstation software specifications	1 year
workstation hardware specifications	6 months
security	1 year
disaster/failure	1 year
database	2 years
electronic communications	2 years
ergonomic	2 years
wiring	2 years
electrical	2 years

The state should arrange for the proposed standards to be evaluated by independent reviewers prior to finalizing them. This standards-setting process will ensure that the proposed system design contained in this document remains current. Figure 8 illustrates the ongoing standards-setting review process.

Figure 8



Technology systems will be built using many products from many different vendors. In cases where product requirements are clear, price will be the major factor in selecting a vendor. In cases with many approaches to solving specific problems, complex evaluation criteria must be developed and used to select vendors or products. Alternative approaches to procurement are offered and specific recommendations for each major type of technology are made.

Competition is the overall procurement strategy to keep the cost of educational technology as low as possible. The design of technology systems will rely as much as possible on widely accepted standards and features that can be met by multiple vendors. Procurement involves several processes to select from competing vendors. Specifically, this section examines five procurement approaches:

- Request for Proposal (RFP)—award is based on price and other factors;
- Invitation for Bid (IFB)—award goes to the vendor with the lowest cost meeting minimum specifications;
- Request for Information (RFI)—approach is used to obtain information about different approaches to address the problem(s);
- existing state contract; and
- local district procurement.

The RFP process is used to solicit approaches to solving complex problems with a variety of solutions. RFPs are used when vendors are expected to propose significantly different solutions and when complex evaluation procedures will be required

to weigh each proposal. An RFP will define the problem and any constraints imposed on its solution. The complexity of writing RFPs and evaluating vendor RFP responses is significantly greater than other procurement alternatives. RFPs should be used only where needed.

An IFB is a simpler process than an RFP. Evaluation is limited to reviewing the responses to ensure that they meet minimum requirements. The award is almost always made to the lowest bidder meeting the requirements. IFBs are useful when there is a clear definition of the specific good or service required and purchase price is the primary determinant of the award. Student workstations or classroom televisions are examples of situations in which IFBs would be appropriate.

An RFI is a procedure used prior to an actual procurement to solicit input broadly and openly from a range of vendors. As the name suggests, it is a public request for information that can be used in the early stage of a procurement process to refine an approach to a problem.

Buying from existing state contracts for goods and services is another alternative for procurements. The task force encourages the development of cooperative agreements between customers and vendors to purchase technology, services, and training at a discount. More specifically, it encourages state policies and/or practices that provide incentives to promote the development of such agreements. Examples of current agreements of this type include state plans, CESA consortia purchasing arrangements, and cooperatives among end-users to establish volume discounts.

Local district procurements should be structured to allow competition among technologies and industries whenever possible to elicit optimum pricing and allow comparison of these alternatives. For communications among schools, vendors of telephone, cable, and wireless services should be allowed to respond.

At the local and regional levels, these procurement approaches will provide:

- local control within equitable, sound standards;
- recognized areas of experimentation and evolution;
- local participation in standards setting; and
- local responsibility for procurement.

At the state level, these approaches feature:

- minimal intervention to ensure equity, inter-operability, and security;
- cost-effective delivery of needed service to localities; and
- group purchases and licensing to realize economies of scale.

Table 2

Recommended Software Procurement Approach

Software Component	Request for Proposal	Invitation for Bid	Request for Information	Existing State/Agency Contract	District Procurement
personal productivity applications	X			X	
communications and information services			X		
instructional technology and management	X			X	
instructional software		X			X
student/school management services	X				
administrative support services	X				
statewide information reporting	X				

Table 3

Recommended Network Procurement Approach

Network Component	Request for Proposal	Invitation for Bid	Request for Information	Existing State/Agency Contract	District Procurement
high-speed backbone				X	
access network		X			
community points of presence	X		X		
Internet access		X			
workstations		X*			
peripherals		X**	X		
voice systems/services	X			X	
building wiring		X***			X*

* every six months, based on updated standards
** every year, based on updated standards
*** district procurement using tailored IFB with assistance from state.

Tables 2 and 3 recommend procurement approaches for major technology components.

The state will need to identify specific components for each district to ensure statewide compatibility. This specification will apply to product requirements and implementation timing. For these situations, the state should develop sample RFPs and IFBs, along with bidder lists and bidder reference information, and make them available to districts. The state should also identify local organizations or qualified consultants who can offer districts appropriate technical assistance in these areas. The installation of building wiring is an example of an area where district procurements would be appropriate.

Software licensing is complex; and considerable experience and skill are required in negotiating such licenses. Negotiators of such licenses must possess considerable knowledge of computer software legal issues and have access to attorneys with backgrounds in computer software and Wisconsin laws. While this plan outlines some alternative software licensing approaches, any one of these alternatives is unlikely to be practical in all cases. Some variables that may lead to different approaches include:

- need to develop software;
- modification of proprietary software;
- off-the-shelf specialized software; and
- individual vendor policies.

Vendors providing PK-12 applications may offer various software licensing alternatives, such as:

- statewide licenses;
- district-site licenses;
- school-site licenses; and
- individual machine licenses.

In conjunction with licensing alternatives, vendors have various pricing policies and guidelines that may incorporate the following:

- size of the computer;
- district/school enrollments;
- number of concurrent users; and
- number of network users.

The intended use of each piece of software must be evaluated carefully to determine licensing requirements. Negotiations with all competitive vendors may be necessary to obtain the most favorable licensing provisions. Experience over many years shows that vendors pursuing large educational procurements will agree to some licensing provisions that are not their usual practice.

The state, regions, districts, and schools must be willing to provide some controls to meet vendors' concerns about proper, licensed use of their software. The recommendation is that statewide or consortia licenses be negotiated whenever possible.

Economies of scale through group purchases should be applied to all education technologies. Examples of current Wisconsin models include:

- satellite teleconferences purchased through the technical college system WisConlink consortium, Wisconsin Educational Communications Board (ECB), UW-Extension, or regional distance education networks;
- distance education classes for high school students and staff development through the Satellite Educational Resource Consortium (SERC) star schools project subsidized by the DPI and the ECB;
- videotaped programs available through technical colleges, CESAs, distance education consortiums, the DPI, and the ECB;
- Internet software licensing, access, and user support through WiscNet service, including BadgerDial, provided by the UW-Madison's Division of Information Technology;
- distance education contracts and purchasing through the DOA's master lease program; and
- telecommunication leases to provide services through regional networks such as ERVING, NWECS, JEDI, WESTWING, CWETN, SCING, etc.

3.8.2 Maintenance

Wisconsin's education leaders and citizens must view technology maintenance as a broad process that keeps technology components productive in the most cost-effective manner. Beyond simply repairing broken equipment, maintenance must address end-user support, upgrading equipment, shifting it to another use when user requirements are no longer met, and disposing of and replacing obsolete equipment. Maintenance planning must consider repair costs and the end-user's cost incurred by unavailability of the technology component. The maintenance process must generate information to monitor, plan, and budget for future procurement and maintenance.

The following maintenance areas should be monitored:

- technology plans, budgets, and policies—effective use of technology is not a one-shot deal;
- telecommunications contracts—services need to be reviewed and renegotiated;
- network infrastructures and equipment—must be maintained to be useful;
- information systems and applications—must be up and working; user friendliness is important to maintain;
- software licenses—version updates and other software purchases and drops (connections to school buildings) require license review;
- consortia membership—effective, useful membership requires continuous work;
- Internet service provider contracts;
- equipment vendor contracts;
- staff development—a technical level of expertise needs to be maintained in any district; and
- funding knowledge and financing options—a district needs to stay informed of available grants, financing programs, and other options.

3.9 Staffing and Organizational Structures

The application of existing and emerging technologies recommended in the *Wisconsin Educational Technology Plan PK-12* will be a significant force in shaping the learning places of the future. Establishing creative learning environments to promote effective delivery of instruction, enhanced teaching and learning, student processes, and the skilled management of administrative school tasks remains the primary reason for infusing technology into educational systems. This dictates establishing an information-age curriculum and integrating the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*.

Further, the pervasive use of technology in the 21st-century school will necessitate additional roles and responsibilities. A move toward the decentralization of decision-making power is occurring in some school districts across the state and nation. Shifting responsibilities from the central office to the classroom will be facilitated by increased accessibility to technology. The following responsibilities will move from central office to the building and classroom levels:

- autonomy for decision-making;
- flexibility and accountability in education;
- coordination and collaboration among teachers and others; and
- time and outcome measurements resulting from improved instruction.

The infusion of technology enables the leadership to change the organization to increase overall operational effectiveness at all levels. Educators traditionally lag in evaluating wise use of personnel and technology resources. The infusion of technology should encourage school personnel to undertake a similar review of job roles to increase the efficiency and effectiveness of teaching, learning, and management functions.

3.9.1 Wisconsin Department of Public Instruction

The Wisconsin DPI can expand technology leadership, support, and coordination for school districts across the state. Results from the technology task force's needs assessment clearly indicated a desire for the DPI to serve school districts in a direction-setting capacity.

The DPI must maintain a strong instructional technology unit before it can begin to serve in a leadership capacity. Current responsibilities associated with educational technology are dispersed among several individuals in the DPI and other agencies. This practice contributes to the concept of "isolated islands of information," which inhibits the development of a systemic and comprehensive approach to technology planning and information dissemination.

3.9.2 Local School Boards

"Every school board should instigate the creation of a school district technology plan."
— Todd Penske, executive director, Educational Technology Board, Wisconsin Advanced Telecommunications Foundation

"We need to educate school boards on the value of technology. Have teachers and boards of education educate the public."
— State Representative Marlin Schneider

Responsibilities of the local school board in implementation of the *Wisconsin Educational Technology Plan PK-12* include the following:

- develop a district technology plan;
- develop required staff competencies;
- purchase necessary hardware and software;
- cooperate with the DPI to develop technology goals; and
- support individual school efforts in education reform.

Because of technology's impact on the quality of schooling in school districts, local board members must be able to access computer-based information. Each board member should have access to the statewide communication network and the local communication network linking local schools and administrative offices.

3.9.3 *District-Level Administrators*

District-level administrators (school superintendents and other district central administrative staff) should exhibit leadership to change the role of district staff from regulatory monitors to service providers. The district's quality of education hinges on the assistance provided to schools in meeting state, district, and local school goals and objectives. These administrators, working with members of various school improvement teams, should be planning facilitators more than trouble shooters. They must value well-organized professional development as essential for all district staff, not just for teachers and principals.

For the superintendent and central staff to provide leadership in restructuring schools, they must have immediate access to information from worldwide data banks. In addition, they must have easy communication access with each other and the schools they serve. The superintendent should explore the possibility of restructuring central office roles and responsibilities to serve the new vision of schooling.

3.9.4 *Building Principals*

The role of the building principal changed significantly during the last five to ten years. Site-based management and collaborative decision-making initiatives significantly affected the duties of the building principal. School improvement depends upon the actions and attitudes of the principal. For systemic change to occur in a school, the principal must:

- lead by example;
- encourage educators to learn, grow, and experiment without fear of reprisal for failure;
- set the example of useful applications of technology;
- delegate responsibility and decision-making;
- foster community involvement in decision-making and goal-setting; and
- provide educators with flexibility to make decisions and to form and reform teaching teams and environments.

3.9.5 *Library Media Specialists*

The school library media program changed dramatically during the last 10 years. Many school library media specialists were quickly dubbed "technology leaders" as they adopted electronic technology for accessing and disseminating information. The library media specialist was often asked to help teachers discover how technology could improve teaching and learning in their classrooms.

As Wisconsin education enters the 21st century, school library media specialists are the prime teachers of information literacy, playing a major role in helping teachers and students address all aspects of educational technology. This includes accessing and processing information to turn it into knowledge and manipulating information to produce new media. School library media specialists' expertise extends to ethical and legal considerations such as copyright, plagiarism, and responsible use of electronic communications media (e.g., the Internet).

Wisconsin school library media specialists and their counterparts in public, academic, and special libraries accomplished much in a short time. Positive contributions to technology include:

- developing and promoting use of WISCAT, a CD-ROM-based electronic catalog listing the library holdings of many (potentially all) Wisconsin libraries; and
- expanding access to information for library users through online library catalogs, CD-ROMs, the Internet, telefacsimile (fax), and online data searching services.

School library media specialists and librarians of all types need to commit to ongoing professional development to deal successfully with the continuing growth and diversification of technology. They must become or continue to be the in-house experts who help teachers, administrators, and school policymakers learn how to apply technology to teaching and learning and to using information.

3.9.6 *School / District Technology Leaders*

Schools and districts will need qualified and technology-skilled educators to model the varied uses of technology for other staff members.

Building Instructional Technology Facilitator

There is a need for an instructional technology facilitator, a person who possesses the leadership skills necessary to facilitate technology activities at the local school building. The facilitator must understand current theories of teaching and learning and possess a foundation in curriculum design. The facilitator should be considerably experienced with an array of technology applications and possess a strong knowledge base of the school's technology hardware, software, and computer network. This person should be given time and support to explore new technologies.

District Technology Coordinator

A district technology coordinator is necessary to provide knowledgeable leadership in integrating technology effectively into the school setting. This person must know the structure of the PK-12 school curriculum and current theories of teaching, learning, and curriculum development and possess considerable technical expertise. The technology coordinator must work effectively with teachers, school administrators, sales personnel, technicians, and community members.

The technology coordinator must be able to deal with planning, budgeting, purchasing, installing, maintaining, and supporting technology. Perhaps the most important qualification is the ability to coordinate a professional development plan for technology that enables staff to move into the information age. Appendix J, the recommendations of the Computer Coordinator Certification Committee, contains a description of competencies needed by a district technology coordinator.

3.9.7 *Classroom Teachers*

The influx of technology changed the role of the classroom teacher. Implications of teachers using technology more in the classroom include the need for:
- careful scrutiny of preservice teacher training;
- professional inservice and other staff development; and
- incentives for teachers to become involved.

Schools offering teacher education must address these issues as a valuable link in the cycle of training and retraining professionals. College faculty members must develop their technology skills to model appropriate uses of technology for their students.

3.9.8 *Parents and Community*

The federal *Goals 2000: Educate America Act* and the Wisconsin school improvement initiative encourage the support and involvement of parents and the community in:

- advocating for children;
- making policy;
- evaluating schooling; and
- becoming lifelong learners.

For community members to assume new roles of participation, they must be well-informed, knowledgeable, thoughtful contributors to the design of the 21st-century school. Access to information and decision-making gives them responsibilities and accountability. Community members and parents will be encouraged to become partners with schools instead of simply consumers of the school product.

3.9.9 *Regional Consortia*

"State funding shall be provided to establish regional centers in strategic geographical locations of the state."
— *A New Design for Education in Wisconsin: Schools Capable of Continuous Improvement*, a report from the Governor's Commission on Schools for the 21st Century, Ody J. Fish, chair

"Consortium-building among PK-12, technical colleges, businesses, UW System, and different school districts is beginning to happen."
— Todd Penske, executive director, Educational Technology Board, Wisconsin Advanced Telecommunications Foundation

A district's structure must account for technology advancements and outline a chain of command and communication channels to help identify potential support personnel. School districts need to maintain a schedule of continuous improvement.

Demand for information on effective technology practices and staff development designed by education technologists is likely to exceed the availability of human and technology resources at the school district and building level.

The establishment of regional consortia or providers (e.g., CESAs) will fill the needs for:

- communication between the DPI and local school districts on effective technology planning considerations, practices, and guidelines;
- training and professional development for equipping district- and building-level leaders with information and strategies on how to develop basic technology skills and competencies for all teachers; and
- assistance to school districts on the development, implementation, and updating of technology plans.

Regional consortia or providers such as CESAs should further involve universities and technical colleges so resources can be shared to save expenses and to cultivate collaboration between PK-12 schools and higher education.

Staffing for the regional consortia or providers should include personnel with significant knowledge and experience, possessing roles and responsibilities such as the following:

- teacher/trainer with experience and background in PK-12 teaching, technology, and staff development;
- administrator/trainer with experience and background in PK-12 teaching, administration, technology, and administrative staff development; and
- technology engineer with experience and knowledge in using an array of technology hardware and networking, including background with the installation of local- and wide-area networks.

3.9.10 *School District Consortia*

If regional consortia or providers are not a viable option, establishing a school district consortium is strongly recommended. The purpose behind a consortium is to pool financial resources to cooperatively purchase school district supplies (e.g., hardware, software, and supplies). This cooperative arrangement also can be tapped to present professional development training addressing educators' diverse needs.

3.9.11 *Higher Education*

"I would like to see better integration of technology in PK-12 and higher education, including technical colleges and distance education."
— Bob Wood, policy advisor, Office of the Governor

Students in teacher education programs should be trained in using technology when working with students. Faculty at Wisconsin institutions of higher education are responsible for being involved in the infusion of technology into the PK-12 curriculum. Faculty at these institutions must model the effective use of technology in all areas of the college curriculum. This modeling must not be restricted only to the colleges of education.

3.9.12 *Statewide Organizations*

"Many businesses are on the cutting edge of technology. They can provide expertise to schools as we institute technological changes. Businesses and schools can share infrastructure such as data lines and Internet access. Facilities such as computer labs could be shared between businesses and schools."
— Jim Morgan, assistant director, Wisconsin Manufacturers and Commerce

Schools must work together with a wide variety of organizations and government agencies at the local, regional, and state levels. This unity of effort must have many partners, including:

- local educational agencies;
- CESAs;
- DPI;
- UW System;
- private colleges and universities;
- Wisconsin Technical College System;
- ECB;
- Educational Technology Board (ETB);
- Wisconsin Advanced Telecommunications Foundation (WATF);
- Wisconsin Public Service Commission;
- Wisconsin Legislature;
- Wisconsin governor's office;
- DOA;
- private businesses; and
- private organizations and associations (such as Wisconsin Manufacturers and Commerce).

The power of this collaboration must not be underestimated. Serious and energetic action by Wisconsin's concerned leadership will produce cooperative decision-making regarding educational technology. In particular, volume purchasing and evaluation of hardware, software and licensing, sharing of technical support, consolidation of training efforts, and formation of business/school partnerships for curricular, technical, and hardware support will result in a more efficient use of public and private resources.

3.9.13 Maintenance and Support

Providing quality maintenance and technical support to a technology system is essential to ensure that a full return is gained on the original investment in hardware and software. Without adequate technical support, money spent on technology is money wasted.

The importance of a technology system must correspond to the organizational mission. Given the expectation that a district's technology system affects the daily productivity of learners, teachers, and those who support the education process, the quality of technical support must be high.

3.10 Policy, Regulations, and Guidelines

Adoption of a systemic view of educational technology represents a major shift from the past, in which educational technology was defined as "getting computers into classrooms." This systemic view presents the state with a broad array of policy and regulatory challenges. Policy, regulations, and guidelines are defined by their effects on a school district's ability to implement technology plans.

- State policy presents statements of direction or general intent for school districts; it does not provide the regulations needed to translate principles into site-specific action plans.
- Regulations derived from policy and legislation establish mandatory compliance in the administration of the technology program.
- Guidelines communicate best practice and expert advice to school district personnel regarding technology implementation.

3.10.1 Policymaking

The goal for establishing policy is to ensure that Wisconsin does not fall behind in planning for the application of technology in its educational system. Criteria relevant to this policy goal include:

- relative cost of the planning options;
- quality of results realized through the options;
- consistency and coherence of the plans produced; and
- degree to which each approach allows the state to forecast long-term resource needs.

3.10.2 Policy Development

The DPI should take the lead in establishing overall policy for program planning and funding and for system implementation, operation, and use. Participation and input of local district leaders should inform this policy development process. Broad, statewide policy statements can serve as examples for policy development at the district level. State-level policy statements should be widely distributed, and school districts should be encouraged to establish policy in a timely manner to guide local implementation and operation.

In addition, the DPI should disseminate pertinent federal and state regulations to local districts so they can develop policy statements requiring personnel to adhere to these laws. As implementation planning continues at the state level, the DPI should publish periodic guidelines and advisories to help local districts align their activities with the key principles of the state plan.

3.10.3 Policy Recommendations

State policy for using technology resources must include areas such as:

- copyright;
- acceptable use of technology and online services;
- vandalism;
- respect for others' work;
- freedom from harassment or threats;
- privacy; and
- equitable access.

3.11 Monitoring and Evaluation

Monitoring and evaluating performance of the technology plan will ensure that the resources invested in technology are improving student learning. Monitoring and evaluation also will identify issues that arise when integrating powerful technology tools into the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*.

Monitoring and evaluation efforts must be designed to keep the implementation on course and to align with the need to demonstrate improved student performance as measured by the Wisconsin Student Assessment System and other building and district evaluation instruments. A careful monitoring and evaluation plan will help to ensure effective and efficient investment of public funds. Appropriate strategies include formative (process) and summative (result) evaluation.

3.11.1 Formative and Summative Evaluation

The process of implementing *The Wisconsin Educational Technology Plan PK-12* must provide feedback that can be used in adjusting operational procedures to achieve maximum results. Flexibility must be maintained so adjustments can be made in the implementation process based on feedback. Strategies must be in place to disseminate the changes statewide.

Summative evaluation should ensure technology components are designed in addition to existing assessment programs, such as electronic portfolios. As implementation proceeds, new data should be collected for later comparisons.

When designing, monitoring, and evaluating systems for technology, it is critical to identify all program components and the associated performance variables to be studied. Implementation of technology is necessarily complex and will involve thousands of educators statewide. The program components must be monitored since many parts of the plan are interdependent. For example, the quality and timeliness of professional development efforts are critical to the effective use of technology, whether for instruction, teacher productivity, classroom management, or school management. Careful evaluation designs should be developed to attribute improvements directly to the technology initiative interventions.

3.11.2 Evaluation Responsibilities

Teachers, administrators, and the DPI should be involved with the process of collecting, aggregating, analyzing, and reporting evaluation information. The state should support evaluation research aimed at determining critical factors in the successful implementation of education restructuring. The state should investigate the standardization of student record formats to make them easier to transfer electronically between districts.

4. Local Technology Planning

The preparation, organization, and effort that accompanies any strategic planning activity typically pays dividends in terms of time, energy, and resources to achieve desired goals. This is especially true relative to educational technology planning at the school or district level. Technology consists of tools that aid communicating, gathering, and processing information, and measuring, analyzing, and improving productivity. Acquiring and effectively implementing technology to enhance student and teacher productivity involves a major transformation from what might be considered traditional educational strategies. If scarce educational resources are to be spent wisely and expeditiously, a systematic process for enacting change must capitalize upon early innovations, successes, and failures.

To receive federal and state instructional technology funds, each district must develop a technology plan that integrates technology into curriculum. Earlier educational technology planning efforts clearly indicate that successful practices are best realized if full attention is directed toward curricular and instructional goals. Curriculum improvement strategies, affecting all students, must be the cornerstone for educational technology integration efforts in Wisconsin's schools.

This section provides detailed guidelines for local technology planning for all schools and districts in Wisconsin. It includes:

- critical factors essential for effective local technology planning;
- a local educational technology planning model that has demonstrated success in helping other schools and districts around the country;
- guidelines for grounding technology planning efforts in the education reform strategies set forth in the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*;
- support services for assisting regions, districts, and schools at various stages in planning for educational technology;
- recommendations to districts and schools for accessing technology planning support; and
- recommendations for initiating a statewide review and monitoring process.

4.1 Critical Factors for Technology Plan and Design Development

Experience with and research on technology planning efforts reveal five factors critical to effective educational technology planning and implementation. They are:

- support of district leadership;
- involvement of community stakeholders;
- curriculum-based information technology initiatives;
- professional development; and
- identification of funding sources.

4.1.1 Support of District Leadership

The local school board, superintendent, key administrators, school improvement teams, and leaders of parent and teacher associations need to be proactive in their commitment and support for technology infusion. With many priorities competing for limited resources in schools, support by key administrators, policymakers, and advisory constituencies is critical to the successful implementation of plan goals.

4.1.2 Involvement of Community Stakeholders

Planning must reflect the experience, knowledge, and perspectives of teachers, students, administrators, parents, school board officials, and local business repre-

sentatives. Everyone affected by decisions regarding technology in schools must be involved and/or well informed. Most important, the vision of how technology can best improve education must be a consensus, fully endorsed by those responsible for implementation and fully supported by those who influence decisions for funding the plan.

4.1.3 Curriculum-Based Technology Initiatives

Planning efforts must focus on improving teaching and learning and on enhancing effective district, school, and classroom management. Improved student performance is the major reason for infusing education technologies into the learning process and is the primary catalyst of community support. Engaging and sustaining funding support and staff enthusiasm for lists of hardware is difficult with few or no clearly articulated linkages to outcomes for students. Therefore, significant decisions regarding educational technology goals and initiatives should be curriculum based.

4.1.4 Professional Development

A major obstacle to successful technology planning and implementation can be the failure to consider the professional development required to prepare and assist educators to effectively integrate equipment and resources into the learning process. Without sufficient professional development, educators may not use educational technology enough or use it simply to automate older instructional methods or to deliver outmoded curriculum. Teachers and administrators must develop new skills, knowledge, and attitudes for applying information technologies in support of education reform as reflected in the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*.

4.1.5 Identification of Funding Resources

A local technology plan needs to take into account potential funding resources that may be combined for successful implementation. The regular budget process is generally inadequate to support a major infusion of technology within a short timeframe. Business partnerships, grant opportunities, Wisconsin's special municipal warrant articles, local foundations, special referenda, and other sources need to be aggressively explored.

Thorough local planning results in establishing clear direction over a timeline that can be expanded or shortened based upon the actual funding generated. School district leadership must budget sufficient funds annually to maintain existing equipment, to update or replace obsolete equipment on a regularly scheduled basis, and to provide necessary technical support staff.

4.2 Educational Technology Planning Model

The proposed local technology planning model outlines the various tasks and activities that comprise an effective, comprehensive planning process. See appendix M.

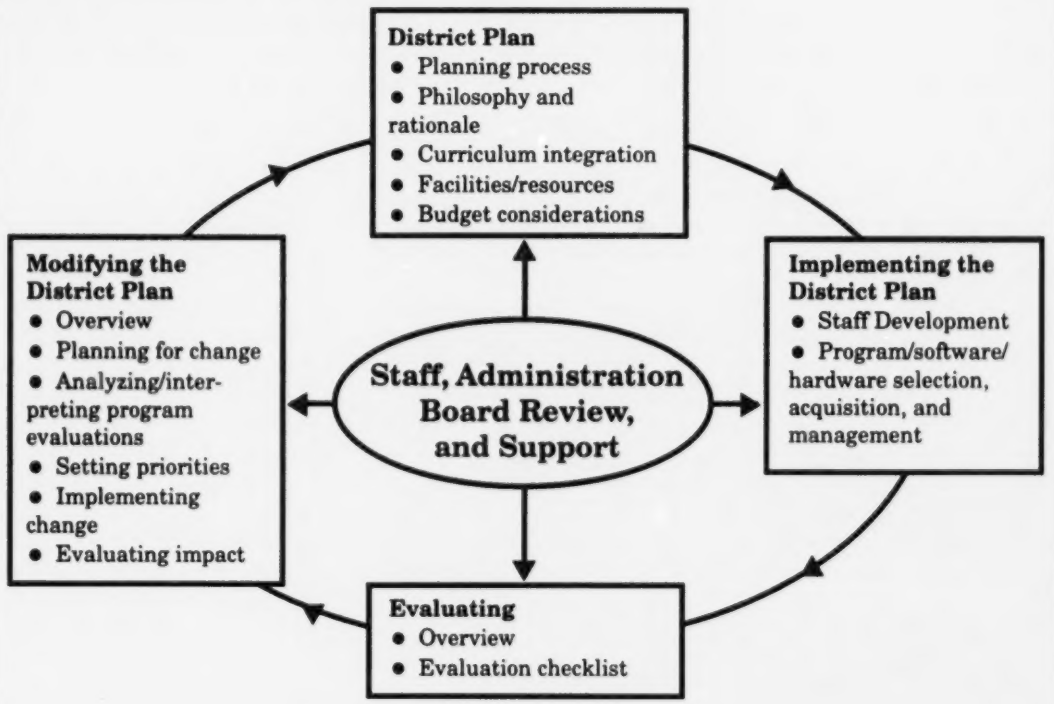
In general, the phases of the planning process may be categorized as follows:

Phase 1 Getting Started
Phase 2 Initiating Educational Technology Planning Activities
Phase 3 Assessing Current Status of Educational Technology Programs
Phase 4 Identifying Initiatives in Support of Education Reform
Phase 5 Analyzing and Designing an Educational Technology Support System
Phase 6 Developing the Implementation Plan
Phase 7 Monitoring, Evaluating, and Revising the Plan

The activities of the planning model are not intended to be accomplished in a strict, linear fashion. Several activities typically may be carried out simultaneously by various working groups. Figure 9 illustrates the planning process that school districts can use in integrating technology into the PK-12 curriculum.

Figure 9

Planning Process for Integrating Technology into the PK-12 Curriculum



From *A Guide to Curriculum Planning in Computer Education* (Wisconsin Department of Public Instruction, 1987)

A sample planning task timeline that parallels the technology planning model can be found in appendix N. The model and timeline constitute a road map for completing a customized educational technology plan that reflects the needs, goals, and unique characteristics of each school or district.

4.2.1 Plan Components

To achieve maximum effectiveness, production of a local technology plan should be a collaborative educational and community effort. Various working groups and constituencies are able to contribute to those aspects that take advantage of their members' special expertise or perspectives. Components of a comprehensive, long-range district technology plan should include the following:

- stakeholder and community resources;
- vision/mission statements;
- assessment of current status and needs;

- goals;
- educational technology and system design;
- long-term strategies and timelines;
- action plan;
- expected results;
- monitoring and evaluation criteria; and
- financial considerations.

4.2.2 Key Questions

Some key questions that should be addressed for the various plan components may be expressed as follows:

Stakeholders and Community Resources

- Is an ongoing information/awareness plan for communicating with stakeholders during the planning and implementation phases expressed in the plan?
- Is there evidence of broad-based involvement of community stakeholders in the composition of the technology planning team?
- Does the plan demonstrate that the district investigated community resources and potential partnerships for acquisition of equipment, services, and support?

Educational Technology Vision and Mission Statements

- Did stakeholders participate in developing technology vision and mission statements?
- Do the vision and mission statements express a commitment to the following:

— providing equity of technology access for all student populations across district and grade levels and within subject areas and classrooms;
— supporting the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals;*
— improving the learning tools for students through integration of information technologies;
— supporting professional development programs for implementation of education reform; and
— providing improved administrative efficiency and accountability?

Assessment of Current Status and Needs

- Did the planning process assess technology skills, knowledge, and attitudes of students, teachers, and administrators?
- Did the planning include an inventory of current software, hardware, and networking?
- Does the plan identify curriculum strengths and weaknesses relative to Wisconsin's education reform initiatives?
- What staffing exists for support of educational technology integration?

Goals

- Is the technology plan an integral component of the district/school improvement plan?
- Does the plan detail goals for the following areas:

— improved teaching;
— improved student learning;
— improved curriculum and instruction;
— improved administration and management;
— improved communications and information access, including telecommunications; and
— ongoing professional development for integration of educational technology into curriculum?

• Do the plan's long-term goals describe how the district's technology initiatives will:
— support schools and district-wide equity;
— support learning outcomes as expressed in the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals*; and
— address the needs for teaching and learning that are identified in the assessment process?

Educational Technology and System Design
• Does the educational technology design indicate software priorities for the following:
— instruction and curriculum;
— administration and management; and
— communications and information access?
• Does the educational technology design indicate hardware, network, and facilities improvement priorities to include the following:
— workstations and peripherals;
— design of local- and wide-area networks; and
— building and classroom wiring?

Long-Term Strategies and Timelines
• Is a multiyear strategy established for the following phased accomplishments:
— software acquisition;
— hardware acquisition; and
— development of local-area and wide-area networks?
• Are multiyear strategies defined for the following:
— staffing for daily operation of instructional and administrative systems and networks;
— personnel needed to support integration of educational technologies with instruction;
— software and equipment maintenance; and
— ongoing professional development?

Action Plan In Support of Technology Goals
• Are objectives, activities, leadership, timelines, and budgets specified for various initiatives for at least the first year of the plan?
• Does the plan include specific first-year initiatives for software procurement; hardware, facilities, and network acquisition and implementation; and operations, maintenance, and upgrades?
• Do the first-year professional development plan initiatives provide adequate support for the integration of technology into the curriculum?
• Do the human resources proposed in the first year adequately support the technology initiatives?

Expected Results
• Does the plan specify what long-term improvements in teaching, learning, and management are expected?

Monitoring/Evaluation
• Does the plan establish an ongoing process for monitoring and evaluating the implementation of the plan?
• Does the plan include a process for ongoing revisions incorporating information from the evaluation?

Financial Considerations

- Does the plan include steps to secure long-term funding from sources such as district budgets, Wisconsin special municipal warrants, bond issues, local education foundations, grants, business partnerships, etc.?
- Does the plan include a multiyear budget summary for the technology initiatives with a breakout for hardware, software, infrastructure, professional development, and staffing?

4.3 Guidelines for Local Educational Technology Plans

The Wisconsin Department of Public Instruction (DPI), in collaboration with other state agencies and members of the Wisconsin Technology Task Force, will develop, adopt, and communicate:

- a statewide vision for utilization and impact of technology in PK-12 education;
- criteria for effective local technology plans;
- a recommended planning model, adaptable to meet the needs of schools and districts at various stages of planning and implementing educational technology;
- clear guidelines for plan content and format, including a suggested table of contents and plan templates; and
- a district self-review process for validating local technology plans.

The Wisconsin Educational Technology Plan PK-12 provides extensive information useful to districts and schools in their local planning efforts. The executive summary and introduction of this report express a statewide vision that provides broad direction for local initiatives. Section 3 outlines components of a proposed statewide education information system. The components are:

- statewide communications network design principles;
- curriculum and assessment;
- technology for lifelong learning;
- professional development;
- equity, access, and use;
- education accountability and reporting system design;
- learning environments;
- technology standards, procurement, and maintenance;
- staffing and organizational structures;
- policy, regulations, and guidelines; and
- monitoring and evaluation.

District planning teams are urged to review the statewide plan as an orientation to the current status of educational technology in Wisconsin and, specifically, to review the strategies for infusing technology into the education process and school improvement plan.

A suggested table of contents for a comprehensive local educational technology plan is offered in appendix O.

4.4 Technology Planning Support

Several levels of support must be made available to organizations overseeing technology planning activities. Regional support is needed to help coordinate and distribute standard information required for state reporting to all districts and schools so that information can be transmitted and received in consistent formats. District support is needed as technology planning teams integrate the needs of all schools into a common plan that is consistent with the mission and vision for all students in the community. Schools need support to enable the building-level technology planning team to identify how technology can best serve the overall school improvement goals.

4.4.1 *Regional Support*

The DPI will seek to support the regional consortia and providers in all regions of the state. They will assist school districts in a variety of ways to attain educational goals and facilitate the use of technology at the district and school levels. The regional consortia will provide leadership in the development of local education technology plans.

Statewide and Regional Planning Seminars

Regional consortia or providers can assist in conducting statewide planning seminars. These seminars will cover a number of topics related to the educational technology planning process and related resources. Districts and/or schools will send planning team representatives to selected programs and sessions appropriate to their particular planning needs. Initial sessions will be designed for district administrators, school board representatives, principals, educational technology directors, teacher representatives, and other key leaders at the district and school level. They will focus upon the technology planning model, critical success factors, the importance of leadership, stakeholder representation and support, and development of funding strategies.

Subsequent sessions with a more technical or detailed emphasis will be geared toward participants with extensive educational technology experience. Sessions that focus on curriculum-based approaches will be structured for teachers, curriculum coordinators, department heads, and others involved in direct instruction. When appropriate, seminars will encourage mentoring and collaboration among participating schools and districts.

Technical Planning Support

Regional consortia or providers will play an important role in providing planning assistance for districts and/or schools with limited technical experience. Available staff will supply the technical expertise needed to evaluate and help design district and school network infrastructures that adhere to state standards and recommendations. Regional consortia or providers will help districts and schools identify the most cost-effective solutions for their needs and may suggest multiplatform and nonvendor specific alternatives.

Ongoing Professional Developmental Services

In addition to assistance in planning regional seminars and technical support, regional consortia or providers will provide Wisconsin educators with ongoing services during the technology planning process.

Regional consortia or providers will help district and school personnel to plan effective professional development strategies for implementation at the local level. They will be a resource for facilitating development of rich educational technology environments. Regional consortia or providers may also make referrals to qualified consultants, organizations, or agencies with skills and expertise in a specific area of technology development or integration. They will promote greater collaborative efforts between post-secondary or higher education institutions and local school districts in the same geographic area.

4.4.2 *District Support*

A district-based approach complements other planning strategies in its focus for developing an educational technology plan in adherence to district, state, and national education goals. The critical factors and methods described in sections 4.1 and 4.2 serve as guiding principles for enacting the educational technology planning process. Local district goals should be consistent with the statewide educational technology vision and plan. The plan should also be supportive of the *Wisconsin Learner Outcomes* and *Wisconsin's Educational Goals* and national education goals.

The district planning team will meet with other active district-level committees, such as committees on curriculum, professional development, and education reform, to identify how technology can affect a variety of ongoing initiatives. The district-based approach encourages individual schools to follow the direction and process designed and monitored at the district level. Strong leadership is likely to come from the district technology coordinator, superintendent, or key school/district personnel who are committed to maintaining high standards and integrity.

4.4.3 School Support

The school-based approach to technology planning is designed to meet the needs of the individual school. School improvement plans are based upon a thorough review of strengths and weaknesses identified through needs analysis. Technology planning will interface with school improvement planning to advance curricular activities that will extend student gains in performance standards and learning outcomes.

Strong building-level leadership is critical to the success of school-based approaches to planning. The principal or key technology-oriented educators are instrumental in developing a cooperative learning environment for teachers and students. The principal will offer encouragement and resources to staff members who demonstrate interest in using technology to achieve educational goals. The educational technology-oriented school leader leads by example, models the effective use of technology with students, and supports the educational goals outlined by the school and district. This person should be recognized as a valuable resource to the school community. Educators who demonstrate lifelong learning and foster a positive learning environment in the classroom and school are key to the success of school-based approaches.

4.5 Accessing Technology Planning Support

A wide range of support should be available for technology planning committees and interested educators. The DPI and regional consortia or providers should develop and monitor a clearinghouse of printed and electronic materials that focus upon the planning processes, education reform, systemic change, and existing and emerging information technologies. Districts and schools should have electronic access to support materials and information that planning teams will find valuable in conducting planning process meetings. Once access is provided, individual districts and schools may analyze and communicate information that best supports the development of their comprehensive plan.

4.5.1 Telecommunications Support

An assortment of telecommunications support is possible today. Below is a brief summary of some methods that can enable ready access to resources pertinent to the technology planning process.

Distance Learning through Satellite/Cable Broadcasts

Through the cooperation of Wisconsin's Educational Communications Board (ECB), the regional fiber, or Instructional Television Fixed Service (ITFS) systems, planning seminars can be broadcast to local schools and districts. Such broadcasts will allow all committee members to participate in seminars and will reduce travel time and expenses. Programs could be interactive, with live call-in question-and-answer periods to clarify information and concepts.

The broadcast of planning seminars can facilitate many different information gathering and meeting strategies. For example, neighboring schools or districts might consider viewing programs at the same location to foster cooperative and collaborative learning. Community stakeholders could be invited to observe the broadcasts to

keep them informed of the broad scope of the technology planning process, while leaving detailed analysis and decision-making to the local planning teams. Capitalizing on distance-learning capabilities will demonstrate the accessing of information that will be the norm in the 21st century.

Electronic Conferencing

Electronic conferencing forums could be set up to assist schools and districts with the technology planning process. Discussion among educators can take place as a real-time event. Planning committees can get information and updates for immediate incorporation into their technology planning processes.

Technical Support Hot Line

A technical support telephone hot line, maintained by regional technical assistance centers, would allow educators to obtain prompt answers to technology planning questions that may be unique to their situations. The hot line would operate during normal school hours during the school year. An answering machine for after-hour calls would give districts and schools 24-hour access. The DPI, ECB, and regional technical assistance center personnel would be trained extensively in the planning process to enable them to respond constructively to technology committee queries.

Online Database Resources (Internet/ERIC)

The establishment of regional and local nodes to the Internet would allow technology advisory committees to access some of the information and communications capabilities now available. Electronic mail (e-mail) could be used to facilitate interpersonal communications between individuals and groups.

Access to the Educational Resource Information Clearinghouse (ERIC) is available through most Internet connections. Technology planning team representatives would be empowered to incorporate current research relative to the use of educational technology in PK-12 classrooms and related research. Greater awareness by PK-12 educators of educational research may inspire involvement in research projects that can advance the development of curriculum-based educational technology strategies.

4.5.2 *Videotape Production and Distribution*

Videotapes could provide schools and districts with information about developing a comprehensive technology plan. Access to videotapes would enable technology planning teams to set their own timelines as they work on planning. Because of early efforts to use technology, some districts and schools are likely to be more advanced in the planning process. The need for basic information would not be equal for all districts and schools. Access to a videotape series would give districts and schools more freedom to address specific topic areas at their own pace.

4.5.3 *Electronic Planning Workbook*

The DPI should develop an electronic planning workbook to help districts and schools with the technology planning process. Closely aligned with the tasks identified in the technology planning model, this workbook would provide educators with printed and electronic versions of tools and templates to facilitate data gathering, consolidation, and manipulation for decision-making. Each workbook section would include references to additional planning resources. As districts complete the workbook activities, they would create components of their district educational technology plans.

The workbook would be presented in an easy-to-use, sequential, step-by-step fashion. A list of prerequisite information and available resources would be followed by an explanation of how best to complete the task and end with a discussion of the conclusions and decision-making that the data support for each task. Workbook activities would assist in the completion of the tasks identified in the seven stages of the Wisconsin local district technology planning model (see section 4.2).

The electronic tools and templates in the electronic planning workbook would include word-processing files that could be used as is or customized by the school or district. These include samples, surveys, curriculum and technology assessment tools, checklists, matrices, organizational templates, and summary forms.

The electronic planning workbook disk version would be available in Windows and Macintosh formats.

4.6 Review and Monitoring Process

District and school technology planning teams will need to know in advance the suggested criteria, developed under the DPI's auspices, that may be used to determine the completeness and thoroughness of their work. These guidelines are expressed in section 4.2 of this document as plan components and key questions.

4.6.1 Technology Planning Team Review

Before a district technology plan is submitted to a local school board, conducting an internal audit and review of the plan is important. The technology planning team should thoroughly review the planning process and the desired learning outcomes. When that process is complete, another group of district-level stakeholders, typically the curriculum improvement or professional development committee, should review the educational technology plan for overall quality assurance.

The next step is to present the technology plan to the district superintendent so this key educational leader can address any issues or questions before submitting the completed plan for the school board's review and approval. The primary criterion for quality assurance is how well the completed technology plan addresses the district's mission and curriculum improvement objectives.

4.6.2 School Board Review

The school board's approval is critical, because the board represents the community's interests and controls the local budget. The board's acceptance of the educational technology plan represents the community's support and the board's approval for formal adoption of the plan. If board members are enlisted as key stakeholders during initial planning activities and periodically informed throughout the educational technology planning process, then the formal school board review should not represent an obstacle for approval.

Appendix P contains a self-assessment checklist for local information technology plans. The checklist should:

- be reviewed by key administrators, planners, and the school board before the planning process is initiated;
- be modified by consensus, if needed, to meet local needs and special circumstances;
- be completed by the school board or its representatives as an important component in the plan review process; and
- result in validation by the school board of the long-term technology plan or in the commitment to revise, expand, or otherwise improve the planning document.

The critical success factors for effective technology planning, the local technology planning model, key questions, and suggested table of contents provide much guidance for plan development. The district self-review process can provide assurances that the plan is reasonable and responsive to district priorities.

4.6.3 Expert External Review

There may be circumstances in which school boards or school district leadership need advice or seek expert review of sections of their educational technology plans. Constructive feedback may enable districts to refine and improve their plans in light of expert perspectives on appropriate models and uses of information technologies in addressing Wisconsin's education reform initiatives.

Inter-district plan reviews are also encouraged. The feedback generated and the insight gained from the review of other district plans will improve the awareness and perspectives of all participants.

5. *Funding Issues and Strategies*

"Introducing technology into our classrooms cannot—indeed, must not—be done 'on the cheap.' We surely will get what we pay for when it comes to technology—to hardware and software and access—and to education."
—State Superintendent of Public Instruction John T. Benson

Wisconsin's efforts in funding educational technology must improve if the state is to maintain its competitive position relative to other midwestern states and the nation. For Wisconsin to remain competitive, the state, school districts, and regional alliances of public and private organizations must invest directly in technology. The state must lead this process through a system of direct aid to schools, incentives for stakeholders, and a state funding system that can realistically achieve state policy goals.

As currently defined, the state's funding system effectively limits increases in school spending, particularly for school districts that do not have an annual budgetary expenditure for technology and districts of declining enrollment. This makes the purchase of technology by schools to meet student needs extremely difficult. In addition, reduced user rates for telecommunications services for schools, universities, technical colleges, and libraries—an increasingly common practice in other states—must be addressed in Wisconsin. Policymakers need to examine direct investments in infrastructure systems that can be used by schools, hospitals, government, technical colleges, and universities.

At the same time, policymakers need to consider the role of telecommunications companies in creating a new generation of customers for their products and services in the public schools. The state should continue to plan and pursue regulations that will facilitate the construction, operation, and interconnection of affordable statewide networks as recommended in the Governor's Blue Ribbon Telecommunications Infrastructure Task Force report. Finally, school districts need to redirect existing resources to fund additional technology purchases, aggressively seeking grants and making difficult decisions about prioritizing some resources to obtain those more critical to accomplishing their missions.

Based on the expressed needs of Wisconsin education stakeholders and the Wisconsin Technology Task Force's understanding of other states' approaches to technology systems, the following benchmarks are recommended for the Wisconsin statewide educational technology system:

- a minimum of one contemporary workstation for every five students;
- one contemporary workstation for every teacher, administrator, and other education professional;
- shared peripherals (e.g., printers, scanners, etc.) and special purpose equipment (e.g., high-end multimedia workstation, laserdisc player, camcorder, etc.) for each school;
- schoolwide networks connecting every classroom and work area for voice, video, and data;
- a wide-area network interconnecting all schools in each district;
- a statewide telecommunications network accessible from every classroom and work area in all schools with access to outside agencies (e.g., municipal government, higher education, public libraries, etc.) and gateways to telecomputing resources such as the Internet; and
- voice, video, and data systems for distance education.

Further, the statewide technology system should be supported with:

- training for all personnel;
- instructional, productivity, and administrative software; and
- equipment and network maintenance and technical support.

The cost of bringing Wisconsin's schools up to speed in technology is significant. The Center for Educational Leadership in Technology (CELT) estimates, for example, that a one-time expenditure of $400 million nationwide would bring only the bottom 10 percent of America's school districts up to the 1995 average of one computer for every 12 children. The Wisconsin Association of School

Boards estimates that for schools to fund the infrastructure to access the Internet for their students and staff would cost $2,000 to $3,000 per month—at current telephone company lease rates. Leases for access to fiber optic lines and associated two-way video programming may be as much as $60,000 to $70,000 per year, excluding equipment or programming costs. While the cost of high quality computers, routers, and peripheral equipment continues to drop, a fully equipped workstation, ready to use, is likely to cost nearly $2,000 per unit.

5.1 System Costs

Clearly, contentious policy issues relate to funding public education. The focus sharpens when raising the question of who should pay for the technology schools need to provide an adequate education to this and future generations of students. As the CELT study *Educating Jessica's Generation* points out, current practices risk the unintended—but very real—social policy of electronic redlining, leaving those with the fewest educational advantages exponentially behind those lucky enough to live in wealthy school districts.

The technology task force believes that while the issues faced in funding technology for schools are complex and difficult, Wisconsin needs to take immediate steps to resolve them. Other midwestern states, including Illinois, Iowa, Indiana, Ohio, and Minnesota directly invest state funds in technology for K-12 education. In Illinois, a recent proposal provides for direct state payment for the installation of and ongoing charges to operate T1 lines for every school district and for regional technical support for schools. Districts are expected to pay for the wide- and local-area networks and end-user equipment they need. In Ohio, direct state funding paid for infrastructure improvements in schools and for the lowest 25 percent of schools to obtain one computer for every five students. To qualify for the funding, districts must have technology plans. In addition, Ohio Public Television is helping districts plan. For some time, Iowa has provided a state-supported distance education network and is moving toward Internet access for all districts. Southern states made direct investments in technology infrastructure, equipment purchases, and, through policy, subsidized rates for schools and libraries (*Heller Report,* February 1996).

If Wisconsin students are to maintain their competitive advantage relative to students in other midwestern states, inaction is not an option. *The Wisconsin Educational Technology Plan PK-12* is a first step in making specific suggestions for action. It provides a framework from which state, regional, and district plans can be developed.

5.2 Enabling Maximum Performance/Cost Structures for Schools

Industry standards for communications, technology devices, and software are rapidly evolving to a higher standard. In particular, the communications industry is in flux with respect to providing services and pricing for education customers. The state's leadership in championing reduced costs for schools continues to be critical and should eventually result in substantial savings for schools and taxpayers.

The minimum equipment specifications and performance standards now used as guidelines by schools are recommended to become requirements if a school district uses significant state funds. The notion of requirements appears to be counter to the spirit of site-based decision-making. However, this type of requirement is quite practical. Schools may be tempted to opt for low-price, lower-capacity resources to conserve funds. By requiring minimum standards, the state will ensure that the equipment purchased will have the appropriate capacity to fully utilize Wisconsin's technology infrastructure and will have a longer useful life.

5.3 The Importance of Continued Planning

Comprehensive local district plans are critical to support funding requests. When legislative leaders and other potential sources of technology funding can review plans with a clear and well-documented direction, well-developed program implementation strategies, and a clear conception of the logical sequencing of tasks to achieve program goals, they will find it easier to support substantial funding requests for technology in support of restructuring education.

As indicated earlier in this report, development of a detailed plan based on the recommendations of this study is critical. Each district should develop a plan that is consistent with the purposes and approaches of the statewide plan. Future federal and state funding could be employed for this purpose.

5.4 Alternative Cost/Funding Models for Enhanced Technology Programs

Clearly, the state budget cannot directly pay for everything. Districts must carry a considerable portion of the costs. State funding paradigms that leverage local matching funds are recommended as one stimulus for continuing technology investment.

Creative funding strategies are needed at the state and local levels. Federal, state, local, and other sources of funding should be combined to offset some of the expected costs. Some potential sources for funding technology include:

- *Educate America Act*;
- *Goals 2000: Educate America Act* (years 2-5);
- Wisconsin Advanced Telecommunications Foundation (WATF);
- Wisconsin Educational Technology Board (ETB);
- competitive federal grant programs from Housing and Urban Development; Labor; Health and Human Services; and Commerce departments;
- National Science Foundation; and
- business partnerships.

Other creative funding strategies involve community participation. Charging fees for public use of this new state-of-the-art technology may ease forming partnerships with business and community organizations to underwrite some costs.

5.5 Recommended Funding Initiatives

Wisconsin's investment in educational technology must increase if the state's students are to maintain their competitive advantage. The task force believes the primary responsibility for funding technology systems lies at the local level. However, the responsibility for installing, funding, and supporting a statewide advanced technology infrastructure rests with the state. State policies and the funding system for public education must necessarily support these goals.

State policies, programs, incentives, and initiatives, combined with direct state funding for an advanced technology infrastructure, are necessary components of any plan that will improve access to technology for all Wisconsin students. The state must permanently fund regional consortia to deliver technology service expertise to assist local school districts in implementing technology planning, and cost-effective implementation. The task force recommends the following specific practices and policies:

- Fund the DPI so it can maintain a strong instructional technology unit to expand technology leadership, support, and coordination for school districts across the state.
- Allow a board of education to borrow, without referendum, up to $1 million agaregate or up to $1,000 per student (whichever is greater) to fund buying technology equipment, telecommunications and distance education contracts, retrofitting buildings, and providing advanced technology support. Repayment of principal and interest would be exempt from revenue caps.
- Reserve at least 50 percent of the annual ETB and WATF funds for noncompetitive allocations to Wisconsin public school districts. This will help ensure equitable access to technology for all Wisconsin students by providing funds to schools that cannot afford to hire grant writers.
- Continue to combine state and private funds to provide grants to public schools, through the ETB and WATF, to purchase technology equipment, telecommunications and distance education contracts, retrofit buildings, and provide advanced technology support.

- Provide for significant increased staff resources to the ETB grant and loan program.
- The Wisconsin Public Service Commission, following guidelines in the federal Telecommunications Act and policies in other midwestern states, should
  - provide permanent rate relief for libraries, schools, CESAs, and accredited institutions of higher learning to support the ongoing costs of using advanced telecommunications systems; and
  - establish a policy so that all Wisconsin citizens can call any school in the public school district where they reside without incurring long-distance telephone charges.
- Provide substantial permanent state funding for regionally based technology services to schools. These services could include planning, grant-writing, network support, purchasing, and professional development. Organizations such as CESAs, technical colleges, universities, and/or regional consortia could provide these services.
- Provide high-speed Internet connections for all schools, libraries, and higher education institutions in Wisconsin at equitable and affordable rates. This might be accomplished by providing permanent state funding for the installation and annual operating costs for high-speed, high-capacity Internet hubs located at regional centers such as technical colleges, universities, and/or regional consortia (such as CESAs).
- Promulgate state rules for approving consolidated federal grants that encourage districts to spend federal grant funds to purchase equipment, support, and professional development for technology.
- Provide permanent state funding to the Department of Administration (DOA) budget to interconnect the current and proposed regional fiber optic networks.
- Provide funding for a statewide DOA position dedicated to negotiating statewide and regional educational contracts in coordination with the University of Wisconsin (UW) System, Wisconsin Technical College System, and other purchasing consortia.
- Develop a statewide PK-12 foundation to solicit technology-related donations on behalf of all school districts and to negotiate licensing agreements in conjunction with DOA purchasing, the UW System, and the Wisconsin Technical College System. Offer incentives for telecommunications providers to contribute to this foundation.
- Encourage, through policy and programs, linkages between school and home through arrangements with vendors for reduced costs of advanced technology for parents and students, tax incentives, and other appropriate means.

6. Legislation

The state legislature should pass the necessary legislation to ensure that local school districts will be able to finance the expansion of technology recommended by the task force in *The Wisconsin Educational Technology Plan PK-12*. Current legislation greatly limits additional expenditures for technology while maintaining the high level of educational excellence for which Wisconsin schools are noted. The Wisconsin Technology Task Force recommends that the legislature provide a mechanism short of referendum to exempt expenditures on local technology from revenue caps for computer technology and educational telecommunications, including the costs associated with the equipment, installation, and service necessary to meet the recommendations of this report.

The technology task force expects the state to provide leadership and guidance to Wisconsin educational institutions by:

- articulating the vision of statewide telecommunication systems;
- setting priorities for implementing the systems; and
- aligning the resources necessary to support development of a single coordinated system.

In addition, new state revenue must be made available on a noncompetitive basis for educational technology and for the professional development of educators to ensure that the technology is used effectively to improve teaching and learning for Wisconsin students.

Wisconsin must remain competitive in the educational marketplace, just as it must in the economic marketplace. Other states aggressively passed appropriate legislation to support the advancement of communication technology and education. Indiana and Iowa passed legislation to build a statewide telecommunications infrastructure. Some states (e.g., North Carolina) *require* that a portion of state and federal funding be targeted at training educators to use technology to assure proper integration into curriculum.

Wisconsin needs a firm financial foundation to assure the development of an efficient infrastructure and professional development of educators in technology use. The economic stability of Wisconsin is a primary reason why legislative support of this nature is needed.

7. *Recommendations / Implementation*

The recommendations of the technology task force identify a direction. The task force recommends what needs to be done. At the state, regional, and local levels, implementation plans must be developed that define how the recommendations will be implemented and which organizations have responsibility for specific areas. State agencies, regional organizations, and local districts all have roles to play in implementation. Within each context (state, regional, and local), decisions must be made about the relative role different state agencies, organizations, or school districts should play. Recommending what those specific roles should be is beyond the scope of this report. See appendix Q for proposed role definitions. A clear delineation of responsibility at all levels and aggressive efforts to cooperate among all parties will eliminate confusion and duplication of effort. With such delineation and cooperation, Wisconsin's plan for technology will reach its potential to benefit all of the state's students.

The technology task force expects the state to provide leadership and guidance by articulating the vision of educational technology systems, setting priorities for implementation, and aligning the resources necessary to provide and develop the statewide technology infrastructure.
(Note—Primary responsibility for implementation is indicated.)

State (S) responsibilities are those that are led by a collaboration between state agencies or organizations such as the legislature, Department of Public Instruction (DPI), Department of Administration (DOA), Educational Technology Board (ETB), Educational Communications Board (ECB), etc.

Regional (R) responsibilities are those that are led by regional entities such as cooperative educational service agencies (CESAs), universities, technical colleges, public library systems, geographical consortia, and collaboratives, etc.

Local (L) responsibilities are those that are carried out by local educational agencies within a single school district.

	S	R	L
State Technology Planning			
The DPI must maintain a strong instructional technology unit so it can serve in a leadership capacity.	X		
The state should make educational technology accessible and affordable throughout Wisconsin by developing regulations and standards that will facilitate the construction, operation, and interconnection of affordable statewide networks.	X		
The state should develop a statewide PK-12 foundation to solicit technology-related donations on behalf of all school districts and to negotiate licensing agreements in conjunction with DOA purchasing, the University of Wisconsin system, and the Wisconsin Technical College System.	X		
The state should encourage, through policy and programs, linkages between school and home.	X		X
Curriculum and Assessment			
The current requirement of integrating technology into all subject areas and grade levels of the PK-12 curriculum is correct and necessary. The failure to accomplish this goal must be addressed.	X	X	X

	S	R	L
Technology for Lifelong Learning Students must develop the skills to become lifelong, engaged learners for individual success and for the economic stability and development of the community.	X	X	X
Professional Development All professional development should model and include the use of current and emerging technology resources.	X	X	X
Educational leaders must establish benchmarks of technological competencies for Wisconsin educators.	X	X	X
Educators must: • share effective technology-infused integration practices with their colleagues;	X	X	X
• utilize the technology itself as a tool to learn and teach about technology; and	X	X	X
• use new developments in telecommunications to provide previously unavailable educational opportunities.	X	X	X
Teacher Certification A set of benchmark standards for technology competencies for teachers should be developed and implemented for Wisconsin PK-12 educators based on criteria like the *International Society for Technology in Education Standards.*	X		
Changes need to be made in the certification and recertification requirements.	X		
Preservice teachers must be required to be technologically competent before they reach the classroom.	X	X	
Wisconsin must improve its teacher training programs.	X	X	
Equity, Access, and Use The state should lay the groundwork for equity across all districts by providing funding for a common base of technology.	X		
The following conditions must be met: • The ratio of students to contemporary instructional workstations ratios will be no more than 5 to 1.			X
• Each classroom will have access and equipment to support video, voice, and data networks.			
• Each district will have access to equipment for originating and receiving distance learning transmissions.			X
• Each district will install local- and wide-area networks with access to global networks.			X
Accountability and Reporting The Wisconsin accountability and reporting system must support using technology to improve how work is carried out by educators, instructional leaders, policy specialists, and those responsible for oversight.	X		

	S	R	L
Administrative Technology Utilization To provide the leadership necessary within their buildings and districts, administrators must adopt and use technology for their own purposes and as a model for staff members.			X
Learning Environments The governor, the legislature, state agencies, and leaders in business, community, and education are responsible for ongoing development and maintenance of a statewide infrastructure.	X		
Implementation of a comprehensive upgrade of the technology infrastructure and environments in Wisconsin schools should be a joint effort at the local, regional, and state levels.	X	X	X
Wisconsin must develop a standard process for designing new and remodeling existing buildings that will ensure that all stakeholders are involved at the proper stage of the project and that responsibilities are clearly outlined.	X		
Regional Consortia Regional consortia or providers, such as CESAs, should facilitate: • communication with local school districts on effective technology planning considerations, practices, and guidelines;		X	
• training and professional development for equipping district- and building-level leaders with information and strategies on how to develop basic technology skills and competencies for all educators; and		X	
• assistance to school districts on the development, implementation, and updating of technology plans		X	
Wisconsin should encourage the establishment of community consortia to develop strategies for assessing and meeting community network needs.		X	X
Local Educational Technology Planning Every district must develop a local plan for integrating technology into the curriculum. The state will make available tools to help districts formulate a plan that fits local needs and responsibilities.			X
Electronic Planning Workbook The DPI will develop an electronic planning workbook to help districts and schools with the technology planning process.	X		
Clearinghouse of Printed and Electronic Materials The DPI and regional consortia such as CESAs should develop a clearinghouse of printed and electronic materials that focus upon the planning processes, education reform, systemic change, and existing and emerging information technologies.	X	X	
Professional Development Teachers and administrators must develop new skills, knowledge, and attitudes for applying information technologies in support of education reform.			X

	S	R	L
Funding			
• Fund the DPI so it can maintain a strong instructional technology unit to expand technology leadership, support, and coordination for school districts across the state.	X		
• Allow a board of education to borrow, without referendum, up to $1 million aggregate or up to $1,000 per student (whichever is greater) to pay for technology equipment, telecommunications and distance education contracts, retrofitting buildings, and providing advanced technology support. Repayment of principal and interest would be exempt from revenue caps.	X		
• Reserve at least 50 percent of the annual ETB and Wisconsin Advanced Telecommunications Foundation (WATF) funds for noncompetitive allocations to Wisconsin public school districts. This will help ensure equitable access to technology for all Wisconsin students by providing funds to schools that cannot afford to hire grant writers.	X		
• Continue to combine state and private funds to provide grants to public schools, through the ETB and WATF, to purchase technology equipment, telecommunications and distance education contracts, retrofit buildings, and provide advanced technology support.	X		
• Provide for significant increased staff resources to the ETB grant and loan program.	X		
• The Wisconsin Public Service Commission, following guidelines in the federal Telecommunications Act and policies in other midwestern states, should	X		
— provide permanent rate relief for libraries, schools, CESAs, and accredited institutions of higher learning to support the ongoing costs of using advanced telecommunications systems; and	X		
— establish a policy so that all Wisconsin citizens will be able to call any school in the public school district where they reside without incurring long-distance telephone charges.	X		
• Provide substantial permanent state funding annually for regionally based technology services to schools. These services could include planning, grant-writing, network support, purchasing, and professional development. Organizations such as technical colleges, universities, and/or regional consortia (such as CESAs) could provide these services.	X		
• Provide high-speed Internet connections for all schools, libraries, and higher education institutions in Wisconsin at equitable and affordable rates. This might be accomplished by providing permanent state funding for the installation and annual operating costs for high-speed, high-capacity Internet hubs located at regional centers such as technical colleges, universities, and/or regional consortia such as CESAs.	X		
• Promulgate state rules for approving consolidated federal grants that encourage districts to spend federal grant funds to purchase equipment, support, and professional development for technology.	X		
• Provide permanent state funding to the DOA budget to interconnect current and proposed regional fiber optic networks.	X		
• Provide funding for a statewide DOA purchasing position dedicated to negotiating statewide and regional educational contracts in coordination with the University of Wisconsin System, Wisconsin Technical College System, and other purchasing consortia.	X		

	S	R	L
• Develop a statewide PK-12 foundation to solicit technology-related donations on behalf of all school districts and to negotiate licensing agreements in conjunction with DOA purchasing, the University of Wisconsin System, the Wisconsin Technical College System, and ECB. Provide incentives for telecommunications providers to contribute to this fund.	X		
• Encourage, through policy and programs, linkages between school and home through arrangements with vendors for reduced costs of advanced technology for parents and students, tax incentives, and other appropriate means.	X		

Appendixes

A. Key Stakeholder Questions and Responses
B. References
C. Wisconsin Learner Outcomes and Wisconsin's Educational Goals
D. Multidisciplinary Unit Plan
E. Integrated Unit Plans
F. Instructional Technology Skills in the Classroom
G. Educational Technology Competencies
H. International Society for Technology in Education (ISTE) Foundation Standards
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Appendix A

Key Stakeholder Questions and Responses

As a part of the information-gathering process, the following people, who are key stakeholders and decision-makers on technology and PK-12 education in Wisconsin, were interviewed:

- Alberta Darling, state senator, Joint Committee on Education co-chair;
- Bob Wood, policy advisor on education to the governor;
- Marlin Schneider, state representative;
- Todd Penske, executive director, Educational Technology Board (ETB), Wisconsin Advanced Telecommunications Foundation (WATF);
- Vicki Poole, School to Work director, Department of Industry, Labor, and Human Relations (DILHR);
- Jim Morgan, vice president of educational programs, Wisconsin Manufacturers and Commerce (WMC);
- Mary Panzer, state senator, Joint Information Policy Committee co-chair; and
- Steve Nass, state representative, Joint Information Policy Committee co-chair.

Key Stakeholder Questions

The committee considered the responses of the key stakeholders carefully while writing the plan. The questions asked and a summary of the stakeholders' responses follow:

1. *What is your vision of technology use for students and administrative-instructional staff in PK-12 schools in Wisconsin?*

   All interviewees supported using technology in PK-12 education. Many mentioned not enough technology is in place and that it is not equitably distributed. Local control of education is important, but state help in funding, technical support and standards, and statewide networking is necessary. It was generally thought that a statewide distance education network of some sort would improve education and the efficiency of its delivery.

2. *How are you able to stay informed about educational and / or technological advances occurring in Wisconsin schools? How would you like to stay informed?*

   Most of the key stakeholders indicated they kept informed as a part of their jobs. They mentioned a wide variety of other resources. While many did not answer the second part of the question, several felt some kind of clearinghouse for information on educational technology would be helpful.

3. *What are the strengths of the schools in Wisconsin? What are some successful technology innovations taking place in Wisconsin? What are some key indicators that validate successful practices taking place in Wisconsin schools?*

   Committed parents/families, teachers, staffs, businesses, higher education institutions, and communities working together are some of the greatest strengths of education in Wisconsin. The Educational Technology Board, the Wisconsin Advanced Telecommunications Foundation, distance education networks, school-to-work partnerships, integration of technology into classrooms, and legislative deregulation of technology were mentioned as innovative developments. High standardized test scores were often mentioned as an indicator that Wisconsin education is on the right track. Perhaps the most heartening comments indicated a general sense of optimism that we would all work together for the benefit of Wisconsin's children.

4. *What are some weaknesses in the delivery of education in Wisconsin schools? What are some key factors that indicate weaknesses in Wisconsin schools?*

   The most common themes related to lack of funding and equity between school districts in the area of technology. Strongly tied to this was the idea that the effectiveness of technological innovation must be evaluated. Some stakeholders felt Wisconsin does not have adequate instruments to evaluate the effects of technology.

5. *What would you like to see accomplished relative to the expansion of technology resources in Wisconsin schools by the year 2000?*

   There was a wide variety of responses to this question. Many related to planning and implementing changes for better integration of technology into the PK-12 schools. The most common theme was providing an information link via Internet, distance education, telephone, etc., from Wisconsin classrooms to available resources worldwide.

6. *What would you like to see accomplished relative to the expansion of technology resources in Wisconsin schools for the 1996-97 school year?*

   There was a dichotomy of answers to this question. Some involved continuing implementation of technology into the schools while others involved stepping back, learning, planning, communicating with the public, and then moving forward. This dichotomy may reflect the wide differences between districts.

Appendix B

References

Some of the materials listed here are referred to in footnotes in the text.

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Wisconsin Learner Outcomes and Wisconsin's Educational Goals

The Department of Public Instruction endorses the following learner outcomes, which were developed by hundreds of educators and other community members from throughout the state. In order for students to demonstrate the outcomes, they will need a solid foundation in the academic subjects of language arts, mathematics, science, and social studies. The outcomes serve as a bridge between Wisconsin's Educational Goals, academic content, and student assessment.

1. **Identify, develop, evaluate, and apply criteria to ideas, products, and performances of one's self or others.**	This outcome requires students to be constructively critical of the work of other persons as well as that produced by one's self. A person should realize when such criticism is objective or subjective. Students should apply criteria developed by themselves as well as those developed by others.
2. **Revise a product, performance, system, and idea in response to relevant information.**	Relevant information might include additional data, changes in a situation, or feedback from experts, peers, or family members. Although the revision may make the item different than it was before, the intent is that the change results in improvement. The expectation is that students will consider all information presented and use that which will result in improvement.
3. **Make informed decisions by examining options and anticipating consequences of actions.**	Familiar sayings such as "look before you leap" and "think before you act" capture the essence of this outcome. Students should gather evidence and information relevant to some contemplated action, weigh the pros and cons of the potential results, and then choose the course of action.
4. **Achieve desired results by interpreting and executing instructions, plans, models, and diagrams.**	This means that students can follow directions in a variety of forms: written, spoken, pictorial, or represented as mathematical symbols. Following directions includes sorting things out when they are not clear as well as evaluating the successful attainment of the desired result. The actual result should be consistent with the intent of the direction-giver.
5. **Recognize and devise systems and describe their interdependence.**	A system is a set of elements that forms a unit or whole. Examples of systems include a musical composition, a game, a procedure designed to solve mathematics problems, weather, ecosystems, and monetary systems.
6. **Create a quality product, process, and performance to meet a need.**	This outcome is a tangible or visible thing or event. It includes paintings, musical performances and compositions, athletic performances, poems or essays, novels, or public policy.
7. **Respond to the aesthetic and intellectual aspects of an event, performance, and product.**	Although similar to outcome No. 6, this outcome focuses on a student's response to something someone else has done. Examples include an opinion, a critique, an essay, and a drawing.

8. Transfer learning from one context to another.	Students should identify similar characteristics of two or more situations, objects, or events. Often these characteristics are not apparent, so students need to be analytical. This outcome also involves finding a practical application for a theory and creating new uses for existing products and applications of ideas.
9. Recognize, define, and solve a problem.	This outcome focuses on situations that are problematic because the solution is not immediately obvious. The student needs to formulate the problem and eliminate irrelevant information. The effective problem solver uses a wide range of strategies and can often identify multiple solutions.
10. Recognize and communicate one's strategies for accomplishing objectives.	Students should reflect upon and explain their own thinking processes. Those approaches should be shared with others.
11. Work effectively in groups to accomplish a goal.	Throughout life—at school, within the family, at work—people must cooperate with others to effectively complete a task or project. This does not imply that working independently is not valued; independent working skills are also necessary.
12. Defend a position by combining information from multiple sources.	The position or point of view being defended could be one's own or that of another person or group. The position may be of a social, political, environmental, economic, or hypothetical nature. Students must gather information from a variety of sources and then blend that information with their own knowledge to create an argument in favor of a position.
13. Develop and test a hypothesis.	A hypothesis is a guess about a rule or relationship among a collection of events, objects, or ideas. Students should devise a plan to identify and collect data, then interpret and use those data to determine whether or not the guess is correct.
14. Recognize when a need for specific information exists and demonstrate the ability to locate, evaluate, and use the relevant information.	Students must be able to consult a recognized authority, to extract information from library sources, and to access electronic databases. This outcome requires students to consider all information, eliminate that which is irrelevant, and then organize what is left into a usable form.
15. Conceive of places, times, and conditions different from one's own.	This outcome includes real as well as fictional places, times, and conditions. Students should think about life as it existed in the past as well as thinking about how it might be in the future.
16. Identify personal interests and goals and pursue them.	Students should work persistently over time on ideas, activities, projects, and goals that reflect their abilities, talents, and interests.
17. Recognize the influence of diverse cultural perspectives on human thought and behavior.	The term "culture" includes groups that share a common history or have a linguistic, racial, geographic, social, or occupational bond that may affect the way people act. Examples include the civilizations of ancient Greece; the Incan Empire; and Hispanic, African, or Asian cultures.

WISCONSIN'S EDUCATIONAL GOALS

VISION

Wisconsin's public schools exist for all students so they have an equal opportunity to attain their highest level of academic achievement, growth, and development.

Public education is a fundamental responsibility of the state. The constitution vests in the state superintendent the supervision of public instruction and directs the legislature to provide for the establishment of district schools. The effective operation of the public schools is dependent upon a common understanding of what public schools should be and do. Establishing such goals is a necessary and proper complement to the state's financial contribution to education. Each school board should provide curriculum, course requirements, and instruction consistent with the goals established. Parents and guardians of pupils enrolled in the school district share with the state and school board the responsibility for pupils meeting the goals.

Educational goals are not all the same. They differ in who implements them, who or what is directly affected by them, and the immediacy of their impact on the classroom. For convenience, the following goals are divided into three major categories: Learner Goals, Institutional Support Goals, and Societal Support Goals.

LEARNER GOALS

Learner goals refer to our expectations for students. What should students know and be able to do as a result of their time in the educational system? These goals apply to the students rather than the society or the institutions within which they are educated.

Schools exist for students to learn and to reach their full potential. The first three learner goals are the basis for development of a statewide assessment system and provide the basis upon which students achieve the other learner goals.

THE LEARNER WILL:

1. Build a substantial knowledge base.

Students will build a solid knowledge base developed from challenging subject matter in computer/information technology, environmental education, fine and performing arts, foreign language, health, language arts, mathematics, physical education, reading, science, social studies, and vocational education.

2. Develop thinking and communication processes.

Students will develop a command of thinking processes (analysis, creative thinking, problem solving, decision making, visualizing, concept development) that permit them to interpret and apply the knowledge base. Communication processes (listening, speaking, reading, writing, viewing, image making, and other symbolizing) enable them to communicate thoughts with others.

3. Apply knowledge and processes.

Students will build upon knowledge and apply learning processes to create new ideas and understandings, enhance human relations, expand awareness, and enrich human experiences.

4. Acquire the capacity and motivation for lifelong learning.

Students will develop their natural curiosity to acquire habits of inquiry and a love for learning which will motivate them to continue learning throughout their lives.

5. Develop physical and emotional wellness.

Students will acquire the attitudes, knowledge, and habits to grow physically and emotionally healthy, develop self-esteem and confidence, and exhibit a healthy lifestyle.

6. Develop character.

Students will exhibit personal characteristics, such as compassion, conviction, curiosity, ethics, integrity, motivation, and responsibility.

7. Be a responsible citizen.

Students will possess and exercise the knowledge and processes necessary for full participation in the family, civic, economic, and cultural life of a complex interdependent, global society. Students will acquire an understanding of the basic workings of all levels of government, including the duties and responsibilities of citizenship. Students will make a commitment to the basic values of our government, including reverence and respect for and the history and meaning of the U.S. flag, the Declaration of Independence, the U.S. constitution and the constitution and laws of this state, and acquire a knowledge of state, national, and world history.

8. Be prepared for productive work.

Students will acquire knowledge, capabilities, and attitudes necessary to make them contributing members of a dynamic national and world economy and prepare them for the transition from school to work.

9. Respect cultural diversity and pluralism.

Students will demonstrate the knowledge and attitudes necessary to understand and respect individual and multicultural diversity and to work cooperatively with all people.

10. Develop aesthetic awareness.

Students will become aware of and be able to generate those forms of experience that have artistic and aesthetic meaning.

INSTITUTIONAL SUPPORT GOALS

Institutional support goals have to do with the learning context and environment and are the means that support the achievement of learner goals. They include such things as adequate buildings, adequately prepared teachers, reasonable teacher planning time, and appropriate materials. Many of these factors have a direct impact on the classroom and the students. Institutional support goals deal with conditions that are within the control of the school district through its school boards and administrators, assuming that society has provided the necessary resources. If a goal affects the learning environment and is attainable without action by entities outside the local school district, it is called an institutional support goal.

To accomplish these goals and provide appropriate instruction, adequate resources, time, staff development, funding, technology, and facilities must be available. A governance model that encourages local decision making might better ensure that all parties play a role in deciding the allocation of resources.

INSTITUTIONS WILL:

1. Focus on academic achievement.

The primary mission of schools will include a focus on academic results to ensure that learning occurs.

2. Set high expectations for students and schools.

School staffs, parents, and community members must set high expectations so that all students will achieve the expected educational results.

3. Address the needs of all students.

Schools will recognize the widely varying circumstances and backgrounds that children bring to school and will design strategies and alternative programs to meet the changing needs and diverse learning styles of students.

4. Establish a climate of respect.

The school atmosphere will ensure that students and staff are treated with respect and dignity so that they respect others and so that students are better able to learn.

5. Provide a wide range of educational offerings.

Schools will offer a wide range of curricular and co-curricular activities so that students will have additional opportunities to learn teamwork, cooperation, and the application of learning.

6. Provide an active learning environment.

Schools will provide an environment in which students are actively engaged in learning that connects curriculum, instruction, and assessment.

7. Provide a positive physical setting for learning.

Schools will provide safe and stimulating environments conducive to active learning.

8. Meet the needs of professional staff.

Staff will have the resources, preparation, and encouragement to perform successfully. Staff should have adequate time and financial support for professional development, collaboration in course planning, strategy development, and innovation to meet the needs of children.

9. Establish family partnerships.

Schools will create an environment that seeks the active participation of families to maximize learning.

10. Promote collaboration within the school and community.

Schools and school boards will facilitate collaboration between and among all school staff and community members and connect the curriculum and delivery of services.

SOCIETAL SUPPORT GOALS

Societal support goals, like institutional support goals, are the means that support the achievement of learner goals. If met, they ensure that students will have the necessary foundation to learn. They include such things as adequate health care, adequate nutrition, adequate funding for education, and safe, drug-free environments. These goals have significance beyond the educational community. Still, they have a crucial, if indirect, effect on children's learning. If children are not secure, properly nourished, or in good health, they will find it difficult to learn. If a goal requires action by forces outside the school district structure, it is called a societal support goal.

To accomplish these goals, society must make the commitment to invest in a quality education for all children, ensure that schools are staffed by well-prepared and caring personnel, invest its resources and leadership to ensure that children flourish, and provide support for families to provide a nurturing environment for their children.

SOCIETY WILL:

1. Make children its top priority.

Wisconsin will make the education and nurturing of all children its top priority.

2. Provide fair and adequate funding for education.

Society will act to resolve the disparities among school district financial resources needed to ensure that students, regardless of where they live, meet state educational expectations.

3. Provide safe schools, neighborhoods, and communities.

Society will promote drug- and violence-free schools and communities.

4. Ensure that children at all levels are ready to learn.

Society will provide support for parents and families to meet the ongoing nutritional, safety, physical, and emotional health needs of their children. Parents and families will instill in their children the importance of education.

5. Develop partnerships.

Society will develop partnerships between and among educators, students, parents, community, labor, business, industry, other educational institutions, and government agencies to better serve students and families.

6. Provide educational, cultural, and recreational opportunities.

Society will provide educational, cultural, and recreational opportunities that will enhance the quality of life and learning for all citizens.

7. Enhance educational equity through information technology.

Society will provide the necessary resources for schools to capitalize on information technologies such as telecommunications and computer networks to extend curriculum by using delivery systems such as distance learning.

8. Support local decision making.

The primary mission of state educational governance will be to support local districts, allow maximum flexibility for local decision making and innovation, and employ reasonable measures of accountability. The primary indicator of district effectiveness shall be academic results.

Multidisciplinary Unit Plan

Title: Problem-solving in science using a database (chemical elements)

Concepts: A computerized database facilitates the problem-solving process by allowing students to organize, reorganize, and sort large amounts of information for analysis and assistance in solving problems.

Objectives: After completing this unit, students will be able to:

- use the Microsoft Works database to arrange, find, and cross-reference data on 30 common chemicals; and
- solve problems related to the characteristics of certain chemical elements by manipulating the Microsoft Works database.

Instructional Rationale

Now more than ever before, scientists are using a large number of tools to collect data about the world. One problem they face is how to organize all the collected information so it can be used to solve problems systematically and quickly.

In this lesson, the student, like the scientist, will be confronted with a similar problem. The student will use a computerized database tool that allows scientists to organize large quantities of data and makes it easy for them to examine it in many different ways. The instructional rationale are to:

- introduce the use of a database as a problem-solving tool in science; and
- enable students to go beyond simply inputting, recalling, and listing data and to move toward evaluating what they see and making inferences about what it means.

Instructional Materials

- student workstation
- activity cards
- materials
- problem statements
- Microsoft Works integrated software package
- student directions

Classroom Schedule

Days 1-2: Traditional classroom setting
Days 3-5: Computer labs
Time: five 45-minute class sessions

Instructional Design

A. Process Objectives—After completing this activity, students will be able to:
- recognize the need to organize data to facilitate the problem-solving process; and
- recognize which data arrangements are necessary to facilitate the investigation (change variables, category headings, etc.) and solve the problem.

B. Content Objectives—After completing this unit, students will:
- develop a greater familiarity with some of the common elements;
- identify the major categories under which elements can be classified – metals, nonmetals, and inert; and
- recognize the relationships between an element's properties and its usefulness.

C. Technologies Objectives—After completing this unit, students will be able to:
- create a database from a listing of related information; and
- manipulate a database to establish relationships among categories of information.

Classroom Management/Organization

This class should be organized into groups of two or three students per group.

Prerequisites
- keyboard skills
- familiarity with Microsoft Works integrated software
- introduction to elements, atomic structure, and periodic table

Student Activities

1. Students, in groups of two or three, examine activity cards. Students should suggest methods of organizing the information and introduce problem statements.
2. Students suggest ways to arrange information to solve the problems. Teacher suggests possible use of a database computer program.
3. Students attempt to create database using Microsoft Works from the information on the activity cards.
4. Students work with completed database file "Elements" and manipulate this file to answer the problem statements.
5. Discuss results. What arrangement was needed to solve each of the problems?
6. Discuss other uses of a database in science.

Teacher Note
- Teachers should familiarize themselves with Microsoft Works integrated software.

Resources
- Microsoft Works manual
- Microsoft Works tutorial

Integrated Unit Plans

"Garden Celebration"

Description

Where does food come from?
Is protecting the environment an individual responsibility?
How do seasons and weather changes affect peoples' lives and the community?
Why are cycles and change, planning and organization, cause and effect important?

This curricular unit, "Garden Celebration," provides young children with direct hands-on experience with the following concepts:

growth and development	cycles/change
personal responsibility	cause and effect
health/nutrition/wellness	weather
food production and distribution	seasons
measurement, counting	the earth
harvesting, cooking	time
environmental awareness	plants
planning, organization	consumerism
the food chain	community
sequencing	classification

Grade Level

- ☒ elementary school
- ☐ middle school
- ☐ high school

Teaching Strategies

- ☒ led by instructor
- ☒ self-study
- ☒ cooperative learning
- ☐ peer tutoring
- ☒ team teaching
- ☒ discovery learning

Optimal Technology Configurations

Custom Computer Configuration	Instructional Technology Cluster	Instructional Technology Classroom	Technology Resource Center	Distance-Learning Complex
☒	☒	☒	☒	☒

Suggested Activities Overview

Instructional Activity	Product	Technology Tools (see key below)
learning about the food we eat	collage	
favorite foods	database	IS
Where Food Comes From		
visit to an orchard	artwork, stories	GR, WP
visit to a farm	illustrated stories, puppets	GR, IS, WP
plant study, research	journals, database	CD, GR, IS, LD, VI, WP
plant terminology	crossword, spelling lists	IS, UT
planning the garden	printout of plots	GR, IS
observing plant growth	bulletin board garden project	
quantifying plant growth	charts, tables	DB, IS, SS, UT
planting the garden	seeds sown in garden	
watching the weather	calendars, reports	WP, UT, gauges
seasons come and go	observations of trends	CD, DB, IS, LD
how the garden grows	play, skit, video	GR, IS, MM, UT
reaping the harvest	invitations to parents	GR
sharing what grew	recipes, presentations	DB, GR, IS, UT, VI, WP
documenting the process	photo album	camera
plant poems	student poetry book	IS, WP
music to grow plants by	student scores	MU

Key for Technology Tools

CD	CD-ROM	**ML**	Micro-based lab
DB	Database	**MM**	Multimedia
DP	Desktop publishing	**MU**	Music software
FA	Fax machine	**PR**	Programming software
FS	Film strip	**SS**	Spreadsheet
GA	Graphical analysis	**ST**	Statistical analysis
GR	Graphics package	**TC**	Telecommunications
HM	Hypermedia	**UT**	Utilities software
IS	Integrated software	**VI**	Videotape
LD	Laserdisc	**WP**	Word processor

"Global Awareness: A Multicultural Unit on Human Rights"

Description

This integrated unit heightens student awareness, understanding, and appreciation of world cultures. Teachers involved in special projects, district specialists, and exceptional education staff were involved in designing this unit. The purpose is to integrate specific subject areas of the curriculum by focusing on a theme of respect and peace among cultures of the world, with the understanding that peace begins with each individual. Students will work as team members to collect specific data regarding quality of life in their assigned regions of the world and will share this information with other teams.

Students will use various research tools, including telecommunications, field trips, guest speakers, and literary analysis, to assist in the design of a class matrix to analyze human rights. The concepts learned in the unit will be incorporated into a persuasive essay and a peacemaker report.

Grade Level

- ☐ elementary school
- ☒ middle school
- ☐ high school

Teaching Strategies

- ☒ led by instructor
- ☒ self-study
- ☒ cooperative learning
- ☒ peer tutoring
- ☒ team teaching
- ☒ discovery learning

Optimal Technology Configurations

Custom Computer Configuration	Instructional Technology Cluster	Instructional Technology Classroom	Technology Resource Center	Distance-Learning Complex
☒	☒	☒	☒	☒

Suggested Activities Overview

Instructional Activity	Product	Technology Tools (see key below)
literary research	novel report	WP
population projection	statistical reports	SS, GA, ML
human rights analysis	matrix	GR, TC, SS
cultural studies	simulation play	WP, MU
United Nations declaration of rights	poetry	TC, WP
world studies	statistical research	TC, ML, DB
data analysis	statistical reports	SS, TC, DB, WP, IS
related arts	recipes, flags, musical review	TC, GR, WP, MU, VI
quality of life	persuasive essay	DB, DP, WP
historical perspectives	peacemaker report	CD, DP, WP, TC
graphical presentation	bulletin board, art work	GR, WP, ML, IS
culminating activity	increase-the-peace feast	DP, HM, MM, MU, VI

Key for Technology Tools

CD CD-ROM
DB Database
DP Desktop publishing
FA Fax machine
FS Film strip
GA Graphical analysis
GR Graphics package
HM Hypermedia
IS Integrated software
LD Laserdisc
ML Micro-based lab
MM Multimedia
MU Music software
PR Programming software
SS Spreadsheet
ST Statistical analysis
TC Telecommunications
UT Utilities software
VI Videotape
WP Word processor

"Global Environments"

Description

Students will study environmental issues from a multi-disciplinary approach that includes local, regional, national, and global topics. Investigating the environment from economic, sociologic, and biologic points of view will expand student perspectives of environmental issues and allow for real-world learning. Telecommunications capabilities can be used to illustrate the global nature of the environment. Students will conduct scientific studies on topics such as acid rain, global warming, and water pollution and will share their findings with other teams locally and globally. Students will conduct literary research on their assigned topics and form conclusions. Students will demonstrate higher-level thinking skills, such as critical and creative thinking, decision-making, and problem-solving, while developing possible solutions to these complex environmental issues. Journals describing student research projects and investigations will be facilitated by creating technology-based presentations. Technology use is critical to this initiative for student success and evaluation.

Grade Level

- ☐ elementary school
- ☐ middle school
- ☒ high school

Teaching Strategies

- ☒ led by instructor
- ☒ self-study
- ☒ cooperative learning
- ☒ peer tutoring
- ☒ team teaching
- ☒ discovery learning

Optimal Technology Configurations

Custom Computer Configuration	Instructional Technology Cluster	Instructional Technology Classroom	Technology Resource Center	Distance-Learning Complex
☒	☒	☐	☒	☒

Suggested Activities Overview

Instructional Activity	Product	Technology Tools (see key below)
pH studies lab	lab reports, graphs	IS, ML, ST
importance of water pH	multi/hypermedia presentation	CD, HM, LD, MM
rainwater analysis lab	science journals	GR, ML, WP
geographic rain pH analysis	spreadsheet	DP, IS, ML, WP
regional rainwater studies	telecommunications logs, database reports	IS, ML, TC, WP
White Pines Impact Study		
environment	multi/hypermedia presentation	CD, GR, HM, LD, ML, MM, TC
sociology	oral presentation	CD, GR, HM, LD, ML, MM, TC
economy	statistical reports	GR, HM, LD, ML, MM, ST, TC
Research Projects		
pH variance	lab report	IS, ML, ST
species tolerance to pH variance	greenhouse experiments	IS, ML, ST
temperature f and pH	laboratory journals	DP, ML, WP
Not in My Back Yard - Landfill Issues		
landfill economics	debate	GR, HM
environmental issues	multi/hypermedia presentation	CD, HM, LD, MM
historical perspectives	position paper	DP, GR, WP
alternatives	newspaper articles	DP, GR, IS, WP

Key for Technology Tools

CD CD-ROM
DB Database
DP Desktop publishing
FA Fax machine
FS Film strip
GA Graphical analysis
GR Graphics package
HM Hypermedia
IS Integrated software
LD Laserdisc
ML Micro-based lab
MM Multimedia
MU Music software
PR Programming software
SS Spreadsheet
ST Statistical analysis
TC Telecommunications
UT Utilities software
VI Videotape
WP Word processor

Instructional Technology Skills in the Classroom

Curriculum and technology will play an unquestionably crucial role in the futures of individual children and our world. Experts from many disciplines advise that technology should and can play an important role in curriculum planning, development, delivery, assessment, and administration. In each subsection, the manner in which technology facilitates developmentally appropriate learning will be offered.

Elementary School

The elementary student population in Wisconsin is eager to learn and is receptive to technology. Having grown up in a highly technological world with access to countless engaging and motivational electronic games, this learner is generally familiar and comfortable with high-technology interfaces. The arena in which learning and development take place must be rich with materials that appeal to and stimulate all of the child's learning modes. In addition to traditional manipulatives and hands-on resources, technology becomes a powerful means with which to engage this learner.

Primary-grade students will exhibit an emerging sense of self and a developing independence. Able to work independently and participate in small- and large-group activities, these students will immerse themselves in rich exploratory environments. Fundamental language arts, mathematics, and socialization skills are the focus of attention in the early elementary years. These children are beginners in all areas, seeking to perfect a diverse array of skills while identifying unique preferences and areas of strength.

The infusion of educational technology into the early elementary classroom is another way to reinforce the use of traditional manipulatives and hands-on resources via a medium that is well within the learner's worldly experiences. Appropriate technology for elementary schools enables students to engage in skill development in mathematics, reading, writing, and other content areas. Computer-assisted instruction programs provide a fun way for children to receive additional practice in basic skills development. Primary learners are able to extend their language arts abilities through interactive engagement with CD-ROM stories. Learners can use their imaginations by writing a story, using a word-processing program, or drawing or painting images with a computer. Children who demonstrate ease of use and an ability to utilize various forms of technology should be provided further opportunities to extend their proficiencies. Additionally, providing young learners with access to educational technology shows them that computers and other media are an integral part of lifelong learning and not an isolated element of their formal schooling.

Armed with the confidence of a full complement of basic language arts, mathematics, and socialization skills, third- through fifth-grade students are interested in a wealth of topics. Today it might be motorcycles and the planets, tomorrow whales and hot air balloons. Provided with a variety of resources, learners are prepared to engage in both semi-concrete and semi-abstract activities. The outcomes of their investigations are always enlightening. Fascinated by the most unusual facts, these students are astute observers and processors of information.

A technologically enriched environment nurtures intermediate-aged learners to process information independently or cooperatively within small group settings. Students are able to work collaboratively toward a common goal by communicating with peers, teachers, and parents through a variety of modes. In addition, students are able to collectively develop a class project using word processing, database, spreadsheets, desktop publishing, telecommunications, or multimedia presentations. Thus, intermediate learners are able to expand the use of educational technology initially introduced in the primary setting by utilizing technology in productive, creative formats.

Reading

The highly interactive and user-managed characteristics of technology lend themselves well to the practice and development of strategic reading. Utilizing text, graphics, and sound in an engaging format, reading software (e.g., laser disc "books," integrated learning systems, and stand-alone reading games) can be easily adapted to progress at the speed and level of difficulty best targeted to each individual learner. Technology supports the interactive nature of the reading process by allowing the reader to be actively engaged in the text through audio, animation, and responses. New and improving technologies such as speech recognition, synthesized/digitized reading of text, animation, and CD-ROM will boost the learner's motivation and ability to expand upon existing reading capabilities. For example, the following reading activities can be presented, practiced, and explored in Wisconsin schools using educational technologies:

- letter and word recognition;
- vocabulary development activities;
- decoding;
- comprehension;
- problem-solving;
- critical thinking;
- determining themes;
- investigation/research; and
- synthesizing.

Language Development

The ability to develop, practice, and use language skills is an important factor in determining successful communication between the learner and the world. Using technology, the student practices both receptive (reading and listening) and expressive (writing, speaking, drawing, painting, and music composition) processing of information.

Specific technology interventions that assist in this objective are:

- software applications promoting the reading of content and instructions;
- video and cable presentations;
- telecommunications;
- distance learning;
- hypermedia presentations;
- speech synthesis software that reads text as directed by the learner;
- laser discs and CD-ROM software that present the learner with a variety of text, graphics, animation, and sound sequences for instructional support;
- word-processing programs;
- graphics, music, and other creative expression software; and
- multimedia presentations that effectively combine a variety of resources for the purpose of sharing knowledge and ideas.

Math Concepts

The language of math becomes clear and meaningful through powerful computer applications designed to support manipulative experimentation. Students are encouraged to use technology to practice math concepts, to explore patterns, forms, and problems.

The ability to individualize the learning situation makes possible the presentation of math concepts in a highly customized format. Young learners can explore the following using a variety of software and hardware tools:

- *classification*—recognizing attributes, patterns and groupings, and numbers;
- *class inclusion*—part-whole relationships;
- *patterning*—counting, sequencing, and ordering objects;
- *numerical relationships*—equivalency, same, different, greater than, less than;
- *number conservation*—addition and subtraction of facts;

- *quantitative conservation*—distribution of materials;
- *length conservation*—distance and time lines; and
- *geometric relationships*—congruence properties of figures.

Science Exploration

Education technology affords the young learner exploring the field of science a multitude of opportunities:

- Using microcomputer-based probes and sensors, the student can collect and compile a variety of types of data (e.g., heat, temperature, color composition).
- Spreadsheet and graphing software assist in organizing and visually presenting information (e.g., plant growth, water analysis).
- Simulation software can place before the learner a variety of situations that are unattainable in the real world (e.g., space travel).
- Basic physics software can replicate experiments that would require inordinate amounts of equipment and involve safety hazards.
- Database compilation can be used to track and report results of classroom experiments.
- Laser discs and CD-ROM can bring to the learner examples of scientific phenomena (e.g., tornadoes, earthquakes).
- Telecommuting programs make possible the gathering and sharing of data with other students around the world (e.g., Internet, National Geographic KidsNet).
- Hypermedia presentations can demonstrate the hierarchical branching organization in the natural sciences (e.g., mapping the animal kingdom with navigational buttons).
- Use of the tools supports the scientific process by encouraging observation, experimentation, positing theories and hypotheses, testing theories and hypotheses, and drawing conclusions.

Social Studies

Elementary learners begin to expand the horizons of their world beyond themselves and their families. At this time, students must develop a sense of belonging to a larger community. They begin by focusing on the immediate environment and expanding to study the nation and the world. Instruction must highlight the issues that confront society in terms that can be easily assimilated by this age group. For instance, recycling to preserve the environment is a theme understood by even the youngest child.

In addition to a wealth of excellent geography, mapping, and history-based software applications available, there are numerous age-appropriate simulations. These simulations offer students the opportunity to participate in historical events or major decision-making events by virtue of role playing. Whether studying the 50 states or debating the pros and cons of declaring America's independence from England, students will find a wealth of excellent technology-based applications to make exploring social studies themes exciting.

Technology can be used in the area of social studies to:

- conduct comparative studies with databases;
- develop an understanding of geographical and physical characteristics of the world with electronic atlases and laser disc video images;
- develop a conceptualization of self, family, and community in the context of the greater world via telecommunications;
- enable role-playing of historical events to enhance understanding using simulations; and
- demonstrate the interconnectivity of humanity via telecommunications.

Middle School

Communication among Wisconsin middle-school students will take place through increasingly sophisticated collaborative efforts addressing authentic and pertinent issues. While growing more aware of the world, students juggle physical changes, responsibilities, expectations, and emerging higher-order thinking skills. Successful experiences among peers during the middle-school years mold adolescents' self-confidence and self-esteem.

Cooperative grouping and project-based learning activities provide the appropriate conditions for middle school students to explore their own defined educational pursuits. Incorporating educational technology further enables exploration in group or individual projects. Working in a learning environment where computer technology is available further reinforces core concepts and principles through writing practice and creative expression, information access, desktop publishing activities, multimedia presentations, and the overall improvement of technology competencies. The availability of educational technologies for middle school students will expand their capacities and skills through an interdisciplinary approach to effective learning.

Some examples of real-life technology capabilities available to Wisconsin middle-school students include:

- accessing information beyond the school walls through "on-line" or telecommunication modes;
- researching information on CD-ROM or other databases;
- drafting three-dimensional designs using computer-assisted design programs;
- writing and publishing the school newspaper by using word processing, graphics, scanning, and desktop publishing applications;
- using spreadsheet/database applications for problem-solving; and
- developing multimedia presentations that include use of a scanner, digitizing camera, CD-ROM, laser disc player, or VCR.

Language Arts / English / Literature

Writing curricula will provide all students access to a technology-rich environment for individual and small group activities. These activities are directed at organizing and analyzing information to use in written communication. Portable computers will allow students to document their experiences as they venture out of the traditional classroom environment. Students will use computers and related technology to draft, revise, and edit writing for a variety of audiences and purposes in all disciplines.

Process writing, with peer collaboration and critique, is a particularly effective activity in the technology-supported writing environment. Students are allowed to focus on content while learning to use resources such as spelling checkers and thesauruses. Editing, experimenting, and revising are also easily accomplished. Students can readily explore homophones, synonyms, alliteration, and word inventions to create vivid and interesting writing.

The need for self-evaluation and introspection by middle-school students suggests the development of daily journals. As early adolescents seek to master abstract reasoning skills, metaphor and symbolism exploration, theme creation, and the expression of main ideas are appropriate tasks. Networking with students from a different environment will lead to a greater acceptance and understanding of different points of view, cultures, and societal differences. Global interaction enhances a student's view of the world.

Electronic writing environments provide practice in producing personal and business letters, thank-you notes, forms, applications, and paragraph development. The publication of short stories, essays, and poems to be shared with audiences within and beyond the school district adds meaning, purpose, and motivation for writing activities. Software programs direct analysis of novels and interpretive essays and lead students through the development of personal essays. Exploration of novels through student writing seeks to emphasize the reading-writing-language connection.

World Languages

Although the study of world language is finding greater acceptance at the elementary level, middle-school students often explore languages. Technology, used independently or in large groups, can assist via the following formats:

- video, audio tapes, and CD-ROM;
- telecommunications (specifically the Internet and distance learning);
- word-processing programs that script and symbolize appropriately; and
- related computer software.

Math

All middle-school students must expand their capacity to think quantitatively and to make intelligent decisions in situations involving measurable quantities. Abstract thinking skills are challenged through the study of algebraic expression, equations, ratios, sets, and thought problems. Within the math classroom, graphing calculators and computers will provide students with the ability to manipulate and experiment with numbers, equations, geometric shapes, and other mathematical concepts. Interdisciplinary units between math and science hold the potential to produce meaningful laboratory data for study in a mathematical context. Simple and sophisticated technology tools graphically display equation plotting, allow for the study of geometry through lines and angles, and provide realistic simulations based upon mathematical models. When necessary, remediation in skill areas can be addressed with quality tutorial math applications.

Middle-school learners can explore the following mathematical concepts with technology learning tools:

- *volume conservation*—understanding interior and exterior space;
- *probability*—predicting odds, likelihood of events;
- *correlations*—relationships and associations;
- *formal schemes*—variations, qualitative and quantitative analyses, and analogies; and
- *formal logic*—if/then syllogisms.

Software applications that provide support for graphing, statistics, data analysis, and making subsequent inferences are particularly helpful in the development of math concepts. Word problems and complex mathematical situations can be presented and offered for independent and collaborative decision-making. Refer to the high school math section for a discussion of the National Council of Teachers of Mathematics (NCTM) standards (in this appendix) related to critical thinking skills.

Science

Within the middle-school science curriculum, students will actively engage in the role of scientist, using technology tools to:

- predict outcomes;
- develop hypotheses;
- collect and interpret data;
- make observations;
- analyze results;
- alter variables;
- identify cause and effect; and
- draw conclusions.

Technology in the middle-school science curriculum allows students to conduct more laboratory experiments and observe reactions. The classroom workstations can assist in both the collection and organization of data. Light, temperature, motion, and pH probes connected to the computer accurately and precisely record and store experimental data. Once data are collected, the computer allows the learner to convert the data easily into meaningful information through graphic representation. Graphs, charts, and printouts can be generated, giving the student several perspectives with regard to interpreting data.

Technology allows students to simulate experiments with materials that cannot be brought into the school environment for safety reasons or for cost factors. To master the scientific inquiry approach, the computer can generate random actions or nonsense organisms for study and hypothesis.

Global Awareness and Global Studies

As the world continues to shrink and its inhabitants assume an ever-greater global consciousness, students will be increasingly exposed to seemingly remote situations with personal ramifications. One distinctive goal of education must be to prepare students for participation in the global arena. Through telecommunications, students are able to participate as "citizens of the world."

Instructional technologies can effectively address students' developmental needs and provide increased recognition and comprehension of global studies in the following areas:

- Simulation software can encourage decision-making and debate surrounding difficult problems.
- Timeline software can visually track the events of history.
- Spreadsheets and database programs can assist in collecting and analyzing data to be interpreted for better understanding of social situations.
- Telecommunications capabilities can assist in promoting greater insight into many cultures.
- Collaborative and cooperative software games provide practice in delegating and assuming responsibility in a variety of socio-political situations.
- Demographic trends can be studied using database, graphing, and charting software.
- Developments such as the Persian Gulf War can be studied and scrutinized using laser disc and CD-ROM technologies.
- Polls and surveys can be conducted and results shared instantly using statistical analysis programs.
- Community issues can be explored and reported through telecommunications.
- Distance learning brings experts and policymakers into the classroom to discuss issues of global concern with students.
- Numerous environmental software applications allow for the study of ecological solutions.
- Many programs present social situations in which the learner is asked to make open-ended choices based upon responsibility and anticipated consequences.

At this level, students not only study the "what" of history, geography, and government but also the "how" and "why." The early adolescent is ready to understand abstract concepts such as democracy, justice, and space.

Fine Arts

The need of students to explore a variety of arenas can be satisfied in a technologically enhanced creative art and music environment. Students use technology to study, manipulate, create, evaluate, explore, and express elements within the art and music curricula.

Computer technology affords students access to the study and creation of animation and cartoons. Drawing programs make the world of graphic design, shape, and color available to students. The computer provides a nonthreatening realm that allows for creativity and experimentation. This allows a creative experience for all students within their middle-school years.

In addition to the standard instrumentation found within the music department, computer systems equipped with Musical Instrument Digital Interface (MIDI) capabilities will afford students the opportunity to experience meter, rhythm, pitch, and volume and to explore the world of music composition. To complement multimedia presentations, students can engage in original music composition. An in-depth review of music theory and techniques used by great composers can be studied piece by piece with the aid of CD-ROM. Composition software integrating the MIDI keyboard interface to the computer is sophisticated enough to function as an instructional laboratory for learning music theory and original composition.

Physical Fitness and Health

Technology integration will provide all students with accurate and timely knowledge necessary to identify and choose healthy lifestyles and activities. Students can discuss and demonstrate the power of biofeedback and stress management with computer generated data; explore the benefits of diet and exercise through computer simulations; and evaluate form and motion of athletics through digitized motion video sequences.

Discussions centered around topics such as sex education, smoking, drugs, alcohol, HIV/AIDS, and other health-related issues can be initiated and motivated with information from video sequences on laser disc, CD-ROM, video tape, or telecommunications.

High School

Students graduating from Wisconsin high schools will face the next stage of their lives with optimism, enthusiasm, excitement, and a sense of preparedness. They will be confident in their knowledge of the world around them and their ability to learn new skills. Whether proceeding on to higher education or entering the world of work, students from Wisconsin will exhibit a sense of community and responsible societal membership that will serve them well in all environments.

High schools need to accommodate the rapid changes across the world by providing students with educational experiences that have relevant applications. Many of these real-life experiences already include various aspects of using technology. Thus, the high school learning environment must support and nurture collaborative efforts, encourage interdisciplinary instruction across the curriculum, and provide access to ideas and resources around the globe.

Students at this level are preparing for entry into the work world or higher education, and they are actively defining their career paths. Wisconsin students clearly must be prepared to assume new roles and responsibilities in direct reaction to the rapidly changing demands of society. We are asking that these learners:

- be flexible, adaptable, and informed;
- have interpersonal and communication skills;
- be able to work independently or in groups;
- continue to be lifelong learners;
- contribute in a meaningful way to the greater community;
- be able to solve problems; and
- think critically and ethically.

In very real and distinct ways, technology can assist learners in accomplishing these objectives.

English / Literature

The ability to understand and express ideas in written and spoken form determines effectiveness in all other areas; mastery of English is critical to the success of the learner. Technology assists in the acquisition of these crucial skills in the following areas:

- reading;
- books on tape;
- supportive CD-ROM;
- disk-based books;
- on-line mentorships;
- writing;
- word processing and printing;
- editing and revising processes;
- multiple printouts for distribution;
- LCD panel used for peer/group critiquing and editing;
- spell-check capabilities;
- built-in thesaurus;
- telecommunications for audience expansion beyond school;
- examples of student products: stories, poems, reports, letters;
- listening;
- group editing;
- constructive criticism;
- video and audiotapes;
- restating skills;
- speaking;
- using microphones;
- posting results to national bulletin boards;
- conducting significant research and comparing results; and
- multimedia presentations.

Math

Although curricular fragmentation will give way to more thematic project-based, problem-based work, math will continue to be a requisite skill throughout the high school years. Technology can be readily used to support math-related life skills, such as electronic checkbook balancing and computing simple compound interest. It can also be employed to enhance a student's communication skills. An example would be interpreting data into visual statistics output and creating graphs and charts to represent numerical data. As a result of the new NCTM math standards and requirements for critical thinking skills, the following uses of technology must be more widely employed:

- gathering and analyzing data (database, spreadsheet, graphing utilities);
- inductive reasoning via guided inquiry;
- developing models, playing "what-if";
- using simulations (market and business applications, probability);
- using technology tools to locate resources of information;
- developing inferential skills by reading visual, numerical data;
- learning specific new math skills (tutorial);
- extending existing skills (drill and practice);
- engaging in logic and sequencing activities;
- using a variety of graphing tools (calculators and software); and
- accessing super computers and international experts.

Science

The expanding focus on the world and beyond gives new meaning to the study of science. By investigating the environment and its inhabitants, the learner assumes a highly personalized interest in this content area. The umbrella of science must be seen as consisting of multiple integrated modules (life, physical, and earth sciences, scientific reasoning, and technology) that should be taught concurrently.

This approach is a requirement of the recently released National Science Teachers Association (NSTA) standards. Science, like math, is focused largely on real-world problems and situations. As such, the learner is drawn into the challenge of finding solutions. Possible technology applications centering on the field of science include, but are not limited to:

- video disk/CD-ROM collections for use as a highly visual aid motivating students based upon exploration of real-world experiences and interactive simulations/models;
- microcomputer-based laboratories that include sensors and probes for conducting scientific experiments and collecting, organizing, comparing, and sharing data;
- telecommunications applications often used in scientific discovery to share scientific data via modem, gather results that are often posted to national bulletin boards, as well as conduct significant research and compare results;
- decision-making software that allows large group participation in current environmental issues while facilitating open-ended exploration of significant problems; and
- accessing super computers and international experts.

Social Studies

Capable of comprehending the human issues of history and culture, the high school learner seeks understanding by investigating underlying factors. At this point, the concept of a "global village" through telecommunications takes on new meanings. The idealism and maturity of the high school student signals a perfect time to engage in stimulating and serious debates, wherein the learner simultaneously practices self-assertion and the rules of social interaction. Technology tools can be used in the following ways:

- real-time access to global news via live data feeds;
- access to worldwide data for research using many technology tools;
- multimedia presentation;

- simulations software applications to provide for issue-based decision-making situations through cooperative and collaborative learning, allowing students opportunities to explore a variety of social and societal quandaries and real-world business simulations while expanding their understanding of the concept of citizenship; and
- mapping, charting, and graphing skills enhanced through software that transfers data into visual representation.

World Languages

In the study of world languages, it is predominantly the high school learner who attempts to master a second language. Technology, used independently or in large groups, can assist via the following formats:

- video, audiotapes, and CD-ROM;
- telecommunications (specifically the Internet and distance learning) for multicultural appreciation and exchange;
- word-processing programs that script and symbolize appropriately; and
- related computer software.

Business

In an ideal situation, high school learners who wished to explore the realm of business could do so in an automated office simulation within the school or through a school/business partnership apprenticeship program.

To understand protocol and procedures, students should be immersed in the day-to-day activities of a business. Technological tools that assist in this endeavor would include the tools of the business world, i.e., networked computers, printers, scanners, telephones (with voice mail), modems, remote access communications (e.g., pagers, cellular phones), copy machines, and fax machines.

Real-world software applications are also essential. Some basic examples include word-processing, databases, spreadsheets, calendars, accounting packages, client management, project trackers, inventory control, and electronic mail. Students will have experience with multimedia presentations, and group interaction via simulated business experiences.

Art

Electronically produced art forms continue to improve with the emergence of newer, more powerful co-processors and better printing capabilities. The student of art now has a wide choice of hardware and software to assist in the creation and study of:

- graphic design;
- animation;
- cartooning;
- three-dimensional imaging and virtual reality;
- tweaking and color separation; and
- real-time research via CD-ROM, video disks, and telecommuting.

Music

Personal expression through music extends to the world of technology. Using a computer equipped with MIDI capabilities, the learner can now produce electronic compositions, transpositions, and scores. Additionally, music can be heard on audio CDs and magnetic media. They can be edited, evaluated, and studied with respect to such concepts as rhythm, meter, pitch, volume, and artistic interpretation. CD-ROMs highlight or archive the music of a particular musician or era. Music can be added to multimedia productions to add feeling or improve their overall quality.

Physical Education

High school learners are at a critical time in their lives with respect to developing a self-disciplined attitude about health and fitness. This is a time when activity levels naturally taper off and when cultural pressures are often luring them to try cigarettes, alcohol, etc. It is perhaps the most opportune time for a student to establish a strong and solid understanding of his/her body, since growing has virtually stopped, and the period of rapid changes has ceased.

Technology offers a variety of biofeedback and stress management strategies for this learner. A quick trip to any fitness center will reveal numerous examples of how electronics are incorporated into equipment for the purpose of individualizing exercise regimens. Individual fitness profiles are readily available for use in most computer environments.

Along with telecommunication access, many computer-based and CD-ROM titles cover diet and nutrition, health, HIV/AIDS awareness and prevention, drug and alcohol abuse, and sex education.

Exceptional Educational Needs Students

Technology tools provide assistance for special needs students exhibiting visual, hearing, physical, and/or language impairments. Adaptations to the learning environments of these students can be accomplished through the use of adaptive/assistive technology devices that can, for example, enlarge print, enhance sound, and provide mobility. The inclusion and mastery of technology competencies will assist these students with the acquisition of content objectives and process skills and the communication of that knowledge to others.

Vocational / Technical / Family and Consumer Education

The world of work is becoming technology-based at a fast rate. In preparing students for lifelong learning, the school recognizes its obligation to provide a highly specialized skill base that is both soundly marketable and resilient. This necessitates introducing vocational education such as technology education (formerly industrial arts) and family and consumer education (formerly home economics) earlier in the learning process. To accomplish these objectives, the vocational program can offer:

- word- and data-processing, desktop publishing;
- personal financial and time management programs;
- environmental management programs;
- computerized diagnostic systems;
- CAD design and drafting;
- electronics training and robotics;
- landscaping, architectural, and interior design software;
- medical technologies;
- communications technologies;
- chemical technologies;
- manufacturing technologies;
- real-time career exploration;
- simulations; and
- agricultural technologies.

Coordinators of vocational/technical programs in Wisconsin should consider investigating the concept of establishing technology-rich "academies," establishing partnerships with technical colleges, and exploring occupationally focused schools. Researching internships with industry and experimenting with the establishment of mentor/apprenticeship programs would also be helpful. Two further recommendations for vocational/technical programs include creating occupational clusters within schools and establishing mastery standards for all students.

Because so many current and future jobs involve occupational technology, these programs must use up-to-date facilities that accurately reflect the work world to prepare graduates adequately for the 21st century.

Adult Learning

Adult learning has changed dramatically as a result of the wealth of information available. The U.S. Labor Secretary's Commission on Achieving Necessary Skills (SCANS) report identified critical technology competencies that 21st-century workers will need. This skill set will be required for young adults pursuing new vocations right out of school or those who wish to acquire further educational training. Regardless of which career path they choose, technology will be utilized as part of their daily operations.

The need for learning will not cease after adults are gainfully employed. Because the use of technology is becoming more common, educational and training needs will continue. Moreover, within private industry, government, and education, technology evolves at such a rapid rate that continuous education and training will be required. Trends indicate that the quality, quantity, size, and affordability of computer technologies improve at an alarming rate of change. As Wisconsin educators increasingly recognize the impact of the information age and accept the responsibility that all workers must become lifelong learners, the more effective their students will be at competing in a global marketplace.

Educational Technology Competencies

	Supts./ Asst. Supts.	Central Office Admin.	Education Technology Director	Building Principals	School Technology Facilitators	All Teachers	Support Staff	College of Education Faculty	"New" Teacher Graduates
Skills/Knowledge									
Input/Output/Devices	AWR	AWR	MGT	FUS	APP	APP	AWR	APP	APP
Word-processing	APP	APP	MGT	APP	MGT	APP	APP	APP	APP
Database	APP	APP	MGT	APP	MGT	APP	APP	APP	APP
Spreadsheet	APP	APP	MGT	APP	MGT	APP	APP	APP	APP
Graphics utilities	FUS	FUS	MGT	APP	APP	APP	FUS	APP	APP
Network systems	FUS	FUS	MGT	APP	MGT	APP	APP	FUS	FUS
Programming	AWR	AWR	MGT	APP	APP	FUS	FUS	FUS	FUS
Desktop publishing	AWR	AWR	MGT	FUS	APP	FUS	AWR	FUS	FUS
Emerging technologies	FUS	FUS	MGT	APP	APP	FUS	AWR	FUS	FUS
Educational Software									
Software evaluation	AWR	AWR	MGT	FUS	MGT	APP	FUS	APP	APP
Integration into curriculum	FUS	FUS	MGT	APP	MGT	APP	AWR	APP	APP
Purchase	FUS	FUS	MGT	APP	MGT	APP	AWR	FUS	FUS
Contemporary Issues									
Ethics	FUS	FUS	MGT	APP	MGT	APP	APP	APP	APP
Equity	FUS	FUS	MGT	APP	MGT	APP	APP	APP	APP
District-level planning	MGT	APP	MGT	APP	APP	FUS	AWR	FUS	FUS
School-level planning	APP	APP	MGT	MGT	MGT	FUS	AWR	FUS	FUS
Telecommunications	FUS	FUS	MGT	FUS	APP	FUS	AWR	FUS	FUS
Distance learning	FUS	FUS	MGT	FUS	APP	FUS	AWR	FUS	FUS
Current research	FUS	FUS	MGT	APP	APP	FUS	AWR	MGT	MGT

Note: As emerging technologies become common, skills associated with their use become more generalized and appropriate to other school/district job roles.

Adapted from the work of W. Beasley and R. Sutton, 1993.

See next page for key to abbreviations.

Abbreviations for Educational Technology Competencies

Minimum level of expertise expected of different educational staff audiences for technology skills, knowledge, competencies, and issues.

Awareness (AWR)—The individual does not have to possess working knowledge of a particular technology but should know its basic use.

Functional Use (FUS)—The individual should be able to functionally use or know more about the technology application. Functional use is the capability to independently begin basic use or generally understand how the technology can be used in the classroom or for administration.

Application Use (APP)—The individual must possess working knowledge of the technology and should know about and demonstrate uses of the technology and how it can be integrated into the classroom or administration.

Management Use (MGT)—The individual must possess advanced working knowledge of the technology and be able to perform more advanced uses and manage or oversee technology operation or issue and report on the scope of its applicability to improve teaching or administration.

Appendix H

International Society for Technology in Education (ISTE) Foundation Standards

All candidates seeking initial certification or endorsements in teacher education programs should receive foundations that prepare them to:

1. Demonstrate ability to operate a computer system in order to utilize software successfully.
2. Evaluate and use computers and related technologies to support the instructional process.
3. Apply instructional principles, research, and appropriate assessment practices to the use of computers and related technologies.
4. Explore, evaluate, and use computer/technology-based materials, including applications, educational software, and associated documentation.
5. Demonstrate knowledge of uses of computers for problem-solving, data collection, information management, communications, presentations, and decision-making.
6. Design and develop student learning activities that integrate computing and technology for a variety of student grouping strategies and for diverse student populations.
7. Evaluate, select, and integrate computer/technology-based instruction in the curriculum of one's subject area(s) and/or grade level(s).
8. Demonstrate knowledge of use of multimedia, hypermedia, and telecommunications to support instruction.
9. Demonstrate skill in using productivity tools for professional and personal use, including word-processing, database, spreadsheet, and print/graphics utilities.
10. Demonstrate knowledge of equity, ethical, legal, and human issues of computing and technology use as they relate to society and model appropriate behaviors.
11. Identify resources for staying current in applications of computing and related technologies in education.
12. Use computer-based technologies to access information to enhance personal and professional productivity.
13. Apply computers and related technologies to facilitate emerging roles of the learner and the educator.

From *Curriculum Guidelines for Accreditation of Educational Computing and Technology Programs* by ISTE Accreditation Committee, 1992, Eugene, OR: International Society for Technology in Education. The National Council of Accreditation for Teacher Education (NCATE) adopted these standards.

Cooperative Educational Service Agency (CESA) Instructional Technology Service Council

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Appendix J

Computer Coordinator Certification Committee Recommendations

Instructional Computing Technology Computer Coordinator Certification Committee

Revised—March 1994

This proposal offers an alternate method to obtain certification, in addition to the current process of academic credit attainment and having universities and colleges recommend individuals for a specific license. In the peer review process, individuals seeking the district level Instructional Computing Technology Coordinator certification will go through a committee review by their peers with the review committee making the recommendation for certification.

The Computer Coordinator Certification Committee (CCCC) recommends that there be a two-step process for this method of certification:

- a nonrenewable three year initial license,
- a renewable five year license.

The initial license shall be issued to persons presently holding the position, eligible to hold a Wisconsin license to teach, upon application, and with the recommendation of the applicant's district administrator. This process shall be coordinated through the DPI. At any time during the three year initial license, application for the peer review may be initiated, in lieu of additional credits to meet the competencies and obtain a renewable five year license. From that time forward a renewal would follow the same requirements for other areas of certification.

For a person not currently in such a position, they may initiate the peer review process to obtain the certification or he/she may choose the academic route. This would result in a five year license to be renewed following the same requirements for other areas of certification.

The CCCC recommends the following steps to implement such a peer review process:

1. This process shall be presented to the DPI State Superintendent for approval through procedures established within DPI.
2. Upon such approval, the DPI shall contact the leadership of the following professional associations to solicit support: Wisconsin Educational Media Association (WEMA), Wisconsin Association of School Administrators (AWSA), Wisconsin Society for Technology in Education (WISTE), Wisconsin Association of School District Administrators (WASDA), and the DPI Bureau for Instructional Media and Technology (BIMT).
3. Support from the above identified associations will be as follows:
   A. Philosophical support for the peer review process.
   B. Identification of member(s) to serve on the Peer Review Development Team to establish the peer review process and financial support for those members during the initial development process.
   C. Identification of qualified members who shall serve on peer review teams.
   D. Financial support for their members to serve on such teams.

Review Process

The DPI shall create a Peer Review Development Committee (PRDC) by selecting members who have been nominated by their professional organizations. The PRDC shall develop the procedures and details relating to the peer review process.

Peer Review Examination Team

1. The Peer Review Examination Teams (PRET) shall consist of five peer reviewers appointed by the DPI and who reflect the competencies established by the DPI Computer Coordinator Certification Committee (CCCC).

2. The peer review shall, through a review of the candidate's written documentation and an oral interview of the candidate, verify that the candidate's portfolio documents sufficient work experience, course work or other professional experiences in order to have met the stated competencies.
3. Upon demonstration of compliance with the competencies reviewed during the Peer Review, the candidate's name shall be forwarded to the DPI Bureau for Teacher Education, Licensing and Placement for the issuance of the renewable computer coordinator license when the application is submitted. If a candidate's application is judged deficient, the review team shall provide the candidate with a written response listing specific competencies not met.

Times/Locations/Fees

It is recommended that the peer review occur at numerous times and at a number of locations throughout the state as determined by the PRDC. It is further recommended that the fee established by the DPI be sufficient to cover all costs associated with the review process.

Proposal

Instructional Computing Technology Coordinator Certification Recommendations via Academic Preparation Program

DPI Computer Coordinator Certification Committee
November 1, 1993

Eligibility to hold a Wisconsin license to teach. Three years of successful teaching experience at the K-12 level, 30 semester credits of which at least 15 are graduate credits in an approved program covering all the following:

(a) Principles and theories of general elementary, middle, and secondary level curriculum development and teaching strategies.
(b) Educational leadership including visioning, strategic planning, goal-setting curricular innovation, program evaluation, problem-solving, and management theory and practice.
(c) Communication skills needed to work and interact effectively within the educational community and the general public.
(d) Planning and management skills associated with instructional design, instructional technology (hardware/software), facility design, work scheduling, and budgeting including grant writing skills.
(e) Planning and managing the evaluation, selection, acquisition, and maintenance of instructional technology (hardware/software).
(f) Integration of instructional technology (hardware/software) into the curriculum through teaching and learning activities.
(g) Knowledge of current and emerging trends and developments in instructional technologies, including information access and delivery systems, networking, telecommunications, and multimedia.
(h) Effective use of technology through the planning and implementation of ongoing staff development programs.
(i) Application of technology to student assessment, management, and evaluation.
(j) Application of Federal and State rules, requirements, and regulations involving instructional technology and information access.
(k) Knowledge of multimedia technologies, experience with design, development, and authoring of multimedia materials.
(l) Knowledge of societal and ethical issues as related to technology including the impact of technology on society, censorship, equity, access issues, rights to privacy, copyright laws, and fair use guidelines.
(m) Awareness of resources for personal professional growth including electronic and printed literature, professional organizations and collegial avenues.
(n) Knowledge of principles, theories, and procedures for selecting, retrieving, evaluating, and managing of information.

Appendix K

Glossary

Audiographics: A system allowing simultaneous transmission of sound and computergraphics over ordinary telephone lines to several sites.

Badger Dial: A dial-up Internet service providing access throughout Wisconsin at a reasonable cost to all public-sector agencies, including schools, libraries, and local units of government. The DOA, DPI, WiscNet, and Ameritech developed this system.

BadgerNet: The DOA is in the process of rebidding its telecommunications infrastructure. This includes the state's voice network (State Telephone System, STS) and the state's data network (Consolidated Data Network, CDN). The process and the new network is referred to as BadgerNet. With recent trends in telecommunication technologies and by economies of scale, the hope is that public institutions, including schools and libraries, will be able to obtain better telecommunication services at lower costs.

Bandwidth: Usually refers to the carrying capacity of a particular communications technology. Technically, it is the range of electrical frequencies a device can handle.

CD-ROM: Compact disc-read only memory. A computer storage medium similar to the audio CD. More than 600 megabytes of read-only information can be stored on one disc.

CELT: Center for Educational Leadership and Technology, 165 Forest St., Marlborough, MA 01752, 508/624-4877. National consulting organization hired to assist the Wisconsin Technology Task Force in developing *The Wisconsin Educational Technology Plan PK-12*.

CWETN: Central Wisconsin Educational Telecommunications Network. Instructional Television Fixed Service (ITFS) network in central Wisconsin.

CESA: Cooperative educational service agency. A nonprofit organization created by the Wisconsin Legislature to address educational needs throughout the state. The 12 CESAs may provide leadership and coordination of services for school districts, including curriculum development assistance, school district management research, special student classes, data collection and dissemination, and inservice programs.

CITSC: CESA Instructional Technology Services Council. Representatives from all CESAs meet to provide leadership and coordination to CESAs in the planning, promotion, and support of appropriate use of instructional technologies.

Compressed Video: A method to send video using less bandwidth than normal by transmitting only changes in moving frames rather than full motion. The reconstituted image exhibits some motion and, depending on the available bandwidth and capacity of the transmitters and receivers, the motion may appear somewhat irregular. This effect occurs in compressed video technology because the moving areas of the image are only approximated.

DILHR: Department of Industry, Labor and Human Relations. State agency that assists and regulates industry and labor and seeks to protect certain human rights. It administers benefit payments that reduce the effects of loss of personal income due to unemployment or work-related injury. DILHR promotes training to improve work skills and employment opportunities and to help business and industry meet workforce needs. The department enforces state labor laws and protects the public from substandard and dangerous conditions in public and private buildings and housing and employment discrimination. DILHR was renamed the Department of Workforce Development on July 1, 1996.

Digital: Information stored in a format consisting of discrete data bits such as zeros and ones. Digital technology converts audio, video, and data into a series of on-and-off signals that form a digital signal less subject to interference.

Distance Education: Instruction that takes place when teacher and students are geographically separated. Telecommunications technologies link them on an interdistrict, interstate, intrastate, or international basis.

DOA: Department of Administration. Executive branch agency in Wisconsin that provides leadership to state agencies in fiscal and budget policy; information technology policy and planning; state energy planning; intergovernmental relations; and state procurement activities. The DOA provides state agencies with services in telecommunications, mainframe and related information technology, print, mail and records management, transportation, and state building design, construction, and maintenance.

DoIT: University of Wisconsin-Madison Division of Information Technology.

DPI: Department of Public Instruction. Official state education agency charged with providing direction and technical assistance for public elementary and secondary education in Wisconsin. It offers a broad range of programs and professional services to local school administrators and faculty. The department distributes state school aids and administers federal aids that supplement local tax resources, improve curricula and school operations, ensure education for children with disabilities, offer guidance and counseling, and develop school and public library resources. Wisconsin Department of Public Instruction, P.O. Box 7841, Madison, WI 53707-7841, 800/441-4563, 608/266-3390.

ECB: Wisconsin Educational Communications Board. Plans, develops, constructs, and operates statewide public radio, public television, and educational telecommunications systems. The ECB works with public-sector agencies as reviewer, adviser, and coordinator in helping them to meet their needs through the use of telecommunications.

Enterprise Database: One database with many tables of data containing information related to all areas of an enterprise (or state agency). All these tables can be related to each other. The database is managed at the agency level and access is controlled by a database administrator. It provides the agency with accurate reliable data and acts as a decision-support mechanism for the agency.

Equity: Refers to the availability of instructional technology to all students regardless of socioeconomic status, culture, region, gender, age, or race.

Ergonomics: Design principles relating to the comfort, efficiency, and safety of users.

ERVING: Embarrass River Valley Instructional Network Group. Wisconsin's first interactive fiber optic network providing K-12 instruction, staff development, and community education.

ETB: Educational Technology Board. Created to administer the K-12 grant and loan programs created in the governor's 1995-97 budget, the board is also charged with providing consultative services to schools. Funding is to be used for educational technology and/or distance education.

ETN: Educational Teleconference Network. An instructional telephone statewide network managed by the Instructional Communications Systems (ICS) of the University of Wisconsin-Extension.

Fiber Optics: A technology to transmit voice, video, and data via light over thin fibers of glass. This technology has much greater bandwidth capacity than conventional cable or copper wire.

***Goals 2000: Educate America Act*:** A voluntary federal program enacted in 1994 that provides funding to states for administration and to local school districts for planning and implementing strategies to improve the quality of education for all students.

HVAC: Heating, ventilation, and cooling.

IASA: Improving America's Schools Act of 1994. Reauthorized the Elementary and Secondary Education Act. Programs totaling $11 billion annually include Title I: Helping Disadvantaged Children Meet High Academic Standards; Title II: Eisenhower Professional Development Program; Title IV: Safe and Drug-Free Schools and Communities; and several other provisions.

ICS: Instructional Communications Systems. An academic support unit within the University of Wisconsin-Extension Continuing Education Division. ICS provides electronic communication and distance education services to University of Wisconsin institutions, state governmental agencies, and other educational, governmental, and nonprofit organizations. The ICS helps organizations and individuals learn to use distance education technologies and to continuously research and test new technologies and applications.

Infrastructure: In technology, this is the underlying mechanism or system by which voice, video, and data can be transferred from one site to another and be processed.

Internet: The global "network of networks" that connects more than 2 million computer hosts. Users can send and receive e-mail, log in to remote computers (telnet), browse databases of information, and send and receive programs (ftp) contained on these computer hosts.

Interoperability: The ability to easily connect to and exchange data with other hardware and software.

ISTE: International Society for Technology in Education. International professional organization promoting effective use of technology for improving education. The Wisconsin chapter is called the Wisconsin Society for Technology in Education (WISTE).

ITFS: Instructional Television Fixed Service. Line of sight, microwave technology for transmitting and receiving sound and video. Requires federal Communication Commission licensing and is reserved for educational use.

ISDN: Integrated Services Digital Network. An emerging digital telecommunications technology that provides higher bandwidth and better signal than regular telephone lines.

JEDI: Jefferson-Eastern Dane Interactive Network. A full-motion, two-way interactive distance education video network.

LAN: Local-area network. A number of computers connected to a server for the purpose of sharing resources, such as software applications, files, peripherals, and services.

LEA: Local educational agency. In Wisconsin, this usually refers to a school district. The official definition from section 14101 of the Elementary and Secondary Education Act is: "A public board of education or other public authority legally constituted within a state for either administrative control or direction of, or to perform a service function for, public elementary or secondary schools in a city, county, township, school district, or other political subdivision of a state, or for such combination of school districts or counties as are recognized in a state as an administrative agency for its public elementary or secondary schools."

MIS: Management Information System. An information system designed to supply organizational managers with the information necessary to plan, organize, staff, direct, and control the operations of the organization.

Multimedia: A very general term that usually refers to computer programs that use a combination of sound, video, animation, pictures, and/or text.

Multiple Intelligences: A theory developed by Howard Gardner that posits the existence of at least seven basic intelligences, viewing just one IQ score as too narrow to be useful. It suggests that intelligence has to do with the capacity for problem-solving and fashioning products in a context-rich environment. The seven intelligences are linguistic, logical-mathematics, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal.

NCATE: National Council for Accreditation of Teacher Education. Only body officially sanctioned by the U.S. Department of Education to accredit schools of education.

NCREL: North Central Regional Educational Laboratory, 1900 Spring Road, Suite 300, Oak Brook IL 60521-1480, 708/571-4700. The regional educational laboratories provide schools and communities with the latest information about learning. The laboratories are examining how various technologies can increase teacher effectiveness and improve student achievement.

NWECS: Northern Wisconsin Educational Communications System. A fiber optic network in CESA 12.

Professional Development: The process by which educational staff members stay current with changes in their fields of expertise. Professional development may include individual study, on-the-job training, or group sessions. This element is critical in effective use of technology.

Protocol: A formal, rigidly defined set of rules and formats that computers use to communicate with one another.

Proprietary: Usually refers to a set of protocols used by only one (or a limited number of) company(ies), as opposed to standards that are shared by a large part of a particular industry.

PSC: Wisconsin Public Service Commission. An independent regulatory agency responsible for overseeing 1,200 public utilities. The PSC sets rates for utilities, including telephone companies and other providers of telecommunications services; determines levels for adequate, safe service; and approves, rejects, or modifies utilities' applications for major construction projects, including fiber optic systems.

Receive Site: A location that can receive transmissions from another site for distance learning.

SCING: South Central Instructional Network Group. An interactive fiber optic network.

SEA: State education agency. The agency primarily responsible for the state supervision of public elementary and secondary schools. In Wisconsin this is the Department of Public Instruction.

SERC: Satellite Educational Resources Consortium. A national consortium, of which the state of Wisconsin is a member, that provides K-12 classes and professional development sessions via satellite.

STS: State Telephone System.

SWECS: Southern Wisconsin Educational Communication System. A regional education telecommunication area that enhances school use of instructional media.

T1 Line: A T1 connection is a major, high-speed, point-to-point, leased telecommunication circuit.

Teleconference: Communication via audio, video, or computer between two or more groups in separate locations.

WAN: Wide-area network. A network of LANs linked by backbone cabling for the purpose of electronically connecting several sites.

WATF: Wisconsin Advanced Telecommunications Foundation. A private nonprofit corporation created to support advanced telecommunications projects and efforts to educate telecommunications users about advanced services. Primary funding is provided by telephone and cable companies.

WEMA: Wisconsin Educational Media Association. A professional organization of more than 1,000 library media specialists, district media coordinators, technology coordinators, computer coordinators, business members, students, and others.

WESTWING: Western Wisconsin Instructional Network Group. An instructional video-audio network in the St. Croix County region.

WiscNet: Statewide data network serving higher education, some K-12 schools, and some businesses with interconnectivity and connection to the Internet.

WisConlink: Statewide satellite video-conference network of the Wisconsin Technical College System.

Wisconsin School Improvement Panel: Appointed by Wisconsin's governor and state superintendent of public instruction to develop the Wisconsin improvement plan to restructure elementary and secondary education. *The Wisconsin Educational Technology Plan PK-12* shall be integrated into that plan.

WONDER: Wisconsin Overlay Network for Distance Education Resources. Fiber optic network including connections to technical colleges, universities, businesses, and K-12 schools.

Workstation: Computer or computer terminal.

WSAS: Wisconsin Student Assessment System. Encompasses three types of assessment: knowledge and concepts tests (multiple-choice and short-answer items); performance assessment tests (in language arts, mathematics, science, and social studies); and voluntary portfolio assessment.

WTCS: Wisconsin Technical College System. Composed of 16 districts with 45 major campuses, plus outreach centers.

Recommendations Regarding Collection of Student Data

State Superintendent's Education Data Advisory Committee

Recommendations Regarding the Department of Public Instruction's Collection of Student Data from Wisconsin Public School Districts

November 2, 1995

Statement

The members of the State Superintendent's Education Data Advisory Committee recommend the development of a standardized statewide Student Records System. Districts will utilize standard formats in this system to provide data to the Department of Public Instruction (DPI) and to transfer student data among school districts, the Wisconsin Technical College System, the University of Wisconsin campuses, and other entities. Each school district will remain free to select the hardware and software vendor of their choice for the processing of student data.

Rationale

We believe this system will reduce the data-reporting burden on school districts and increase the efficiency and accuracy of transferring data to the DPI, among districts and to other appropriate entities. Further, it will enable the DPI to quickly respond to legislative and other queries, as prescribed by law, with the least amount of disruption to districts. In addition, it will allow the political, legal, and societal forces to dictate and adjust the collection and dissemination of the data as necessary.

Requirements

1. Legislation must be adopted that will ensure the security and confidentiality of individual student data stored at the DPI and that will prescribe the school district reporting requirements to the DPI.
2. Data definitions must be provided that assure consistency of data.
3. Steps must be taken to assure data integrity.
4. A representative body must be established to authorize changes to the system.
5. An appropriate pilot period must be provided to allow the DPI and school districts to properly test the system.
6. School districts must have electronic access to the data-reporting programs/routines utilized by the DPI so they can reproduce DPI reports for their districts.

Appendix M

Local Educational Technology Planning Model

Phase 1 Getting Started	Phase 2 Initiate Technology Planning Activities	Phase 3 Assess Current Status of Education Technology Programs	Phase 4 Identify Goals in Support of Education Reform
1.1 Secure the support and commitment of local education leaders.	2.1 Develop the education technology mission and vision statements with team.	3.1 Assess the technology skills, knowledge, and attitudes of staff and students.	4.1 Determine and prioritize technology goals for improving administrative and management effectiveness.
1.2 Identify and secure support of educational community stakeholders.	2.2 Develop an ongoing public information and awareness plan for communicating with stakeholders.	3.2 Develop inventory of software, hardware, facilities, and network capacity to provide information for ongoing decision-making.	4.2 Determine and prioritize communications and information access goals for improving teaching, learning, and classroom management.
1.3 Establish technology planning team with broad-based stakeholder representation.	2.3 Share education technology mission and vision with stakeholders.	3.3 Review existing education technology initiatives and assess curriculum strengths and challenges in relationship to education reform.	4.3 Determine and prioritize instructional and curricular technology integration goals and technology proficiency milestones for students.
1.4 Clarify how technology practices can support education reform and economic development.	2.4 Identify tasks, timelines, and responsibilities for planning team.	3.4 Assess existing professional development activities and structures in support of technology integration.	4.4 Determine and prioritize professional development goals based upon identified student and staff technology competencies.
1.5 Orient team to overview of planning process, identify leadership roles, and establish focus groups and planning subcommittees.	2.5 Establish internal communication process among subcommittees and other groups engaged in activities related and relevant to technology planning.	3.5 Assess current technology support staffing.	4.5 Identify strategies for aligning technologies with goals.
1.6 Research, describe, and demonstrate existing and emerging technologies to team and stakeholders.	2.6 Identify and investigate potential community resources, partnerships, and funding sources.	3.6 Identify expenditures for technology for past two years.	4.6 Report preliminary goals to stakeholders and public and explain how technology will support implementation of the identified goals.

Phase 5 Analyze and Design Technology Support	Phase 6 Develop Action Plans for Implementation	Phase 7 Monitor, Evaluate, and Revise the Plan
5.1 Determine instructional, administrative, and communication software requirements.	**6.1** Develop action plan (activities, leadership, timelines, technology support, policy, budget) for administrative and management goals.	**7.1** Establish and implement process for monitoring implementation of action plan and evaluation of impact of technology integration.
5.2 Determine hardware, facilities, and network (voice, video, and data) standards and requirements.	**6.2** Develop action plan for communications and information access goals.	**7.2** Establish and implement ongoing communication process with stakeholders and public.
5.3 Determine strategies for operations, maintenance, and upgrades.	**6.3** Develop action plan for instructional and curricular goals.	**7.3** Develop an ongoing process for incorporating evaluation information for planning.
5.4 Determine effective models for professional development in support of education reform and technology integration.	**6.4** Develop action plan to align professional development goals.	
5.5 Determine human resource organizational structure for implementation of identified goals.	**6.5** Develop action plan for securing additional human resources in support of identified goals.	
5.6 Plan strategies to implement administrative, communications, and instructional aspects of plan.	**6.6** Develop the line item budget and plan to secure funding for plan implementation.	

Educational Technology Planning Task/Timeline

Task No.	Task Description	Person(s) Responsible	Start Date	Finish Date	Resources Required
Phase 1	**Get Started**				
1.1	Secure support/commitment of district leadership				
1.2	Identify and secure support of community of stakeholders				
1.3	Establish technology planning team with broad-based stakeholder representation				
1.4	Clarify how technology practices can support education reform and economic development				
1.5	Orient team to overview of planning process, identify leadership roles, and establish working groups				
1.6	Create/review educational technology vision and mission statement with team				
Phase 2	**Initiate Educational Technology Planning Activities**				
2.1	Share educational technology vision with community of stakeholders				
2.2	Research, describe, and demonstrate existing and emerging technologies to stakeholders				
2.3	Identify tasks, timelines, responsibilities, and milestones for planning				
2.4	Develop ongoing public information/awareness plan for communicating with stakeholders and public				

Task No.	Task Description	Person(s) Responsible	Start Date	Finish Date	Resources Required
2.5	Investigate potential community resources and partnerships				
2.6	Establish an internal communication process among working groups				
Phase 3	**Assess Current Status of Educational Technology Programs**				
3.1	Assess the technology skills/knowledge/attitude of students, teachers, and administrators				
3.2	Develop inventory of software, hardware, facilities, and capacity to provide information for decision-making				
3.3	Review existing education technology initiatives and assess curriculum strengths and weaknesses				
3.4	Assess existing professional development activities and structures				
3.5	Assess current technology support staffing				
3.6	Identify expenditures for technology during past two years				
Phase 4	**Identify Initiatives in Support of Education Reform**				
4.1	Determine and prioritize administrative/management goals and initiatives				
4.2	Determine and prioritize communications and information access goals and initiatives				
4.3	Determine and prioritize instructional/curricular technology integration and initiatives for improving teaching and learning				
4.4	Determine staff competencies for supporting student learning and delivering education reform initiatives				

Task No.	Task Description	Person(s) Responsible	Start Date	Finish Date	Resources Required
4.5	Report to public and stakeholders how technology will support goals and initiatives				
Phase 5	**Analyze and Design Educational Technology Support System**				
5.1	Determine instructional, administrative, and communications software requirements				
5.2	Determine hardware, facilities, and network (voice, video, data) standards and requirements				
5.3	Determine strategies for operations, maintenance, and upgrades				
5.4	Determine models for professional development in support of education reform and technology				
5.5	Determine human resource organizational structure for implementation				
5.6	Construct cost matrices and line-item budget for technology needs				
Phase 6	**Develop Implementation Plan (leadership, activities, timeline, and budget)**				
6.1	Develop software procurement and implementation plan				
6.2	Develop the plan to acquire and implement hardware, facilities, and network standards and requirements				
6.3	Develop the plan to implement operations, maintenance, and upgrades				
6.4	Develop the professional development plan in support of curriculum and instructional initiatives				
6.5	Develop the plan to secure additional human resources in support of technology				

Task No.	Task Description	Person(s) Responsible	Start Date	Finish Date	Resources Required
6.6	Develop the plan to secure funding, with consideration of collaborative, cost-sharing initiatives				
Phase 7	**Monitor, Evaluate, and Revise the Plan**				
7.1	Establish and implement monitoring and evaluation process				
7.2	Develop an ongoing process for incorporating evaluation information for future planning				
7.3	Establish and implement an ongoing communication process with stakeholders and public				
7.4	Establish process and timeline for ongoing, long-term planning				

Appendix O

Recommended Table of Contents for a Local Educational Technology Plan

Executive Summary

1. **Introduction**
   Educational Technology and Education Reform in Wisconsin

2. **Background Information**
   - 2.1 School/District and Community Demographics
   - 2.2 Overview of the Educational Technology Planning Process
   - 2.3 Stakeholders and Community Resources
   - 2.4 District Educational Technology Vision and Mission Statements

3. **Program Goals and Educational Technology Initiatives in Support of Education Improvement**
   - 4.1 Administrative and Management Goals and Initiatives
   - 4.2 Communication and Information Access Goals and Initiatives
   - 4.3 Instructional and Curricular Goals and Initiatives
   - 4.4 Staff Competency Goals in Support of Student Learning and Education Reform Initiatives

4. **Current Status**
   - 3.1 Assessment of Student and Staff Technology Skills, Knowledge, and Attitudes
   - 3.2 Inventories
     - — Software
     - — Hardware
     - — Facilities
     - — Networking and Telecommunications Capacities
   - 3.3 Current Status of Curriculum and Educational Technology Initiatives in Relationship to Education Improvement
   - 3.4 Review of Existing Professional Development Activities and Structures
   - 3.5 Assessment of Current Educational Technology Support Staffing

5. **Technology Design**
   - 5.1 Software Priorities
     - — Administrative and Management
     - — Communications and Information Access
     - — Instructional and Curricular
   - 5.2 Hardware, Facilities, and Network Priorities
     - — Hardware: Workstations and Peripherals
     - — Facilities: Network Design
     - — Building and Classroom Wiring: Standards
     - — Implementation Issues
     - — Operations, Maintenance, and Upgrades Priorities

6. **Educational Technology Implementation Action Plan (Leadership, Activities, Timeline, Policy, Budget)**
   - 6.1 Software Procurement
   - 6.2 Hardware, Facilities, and Network Acquisition/Implementation
   - 6.3 Operations, Maintenance, and Upgrades
   - 6.4 Professional Development
   - 6.5 Additional Human Resources in Support of Technology

6.6 Funding Sources
6.7 Budget Summary

7. Monitoring, Evaluation, and Revision of the Educational Technology Plan
7.1 Monitoring and Evaluation Process
7.2 Incorporation of Evaluation Information for Ongoing Planning
7.3 Process for Reporting to Stakeholders
7.4 Process and Timeline for Ongoing, Long-Term Planning

Self-Assessment Checklist for Local Educational Technology Plan

The following checklist can be used by the district technology planning team, key administrators, and the school board to determine if the plan includes important components of a comprehensive educational technology plan. Circle the number that reflects the degree or extent to which the district plan demonstrates that each issue has been addressed.

Stakeholder Involvement

1. To what degree was the district's educational technology mission and vision developed with the input of key stakeholder representatives?

very little_____extensive
1 2 3 4

2. To what extent were stakeholders engaged in the development and/or review of the plan's broad, long-term technology goals?

very little_____extensive
1 2 3 4

Current Status

3. To what degree did the planning team assess the current status of the following:

A. hardware, software, and network capacities

very little_____extensive
1 2 3 4

B. staff and student technology skills, knowledge, attitudes, and access

very little_____extensive
1 2 3 4

C. technology-related professional development

very little_____extensive
1 2 3 4

D. technology support staff

very little_____extensive
1 2 3 4

Long-Term Educational Technology Goals

4. To what extent are the educational technology goals clearly linked to improving student learning as expressed in the local district plan, the *Wisconsin Learner Outcomes,* and *Wisconsin's Educational Goals* and to enhancing the effectiveness of classroom, school, and district administration and management?

very little_____extensive
1 2 3 4

5. To what degree do the long-term goals include strategies for providing adequate technology-related staffing?

very little_____extensive
1 2 3 4

6. To what degree do the long-term goals include strategies for providing adequate software, hardware, networking, and maintenance?

very little_____extensive
1 2 3 4

Professional Development

7. To what extent does the professional development plan identify the technology skills that staff and students need?

very little_____extensive
1 2 3 4

8. To what extent does the professional development plan provide adequate support for the integration of educational technology into the curriculum and school operations?

very little_____extensive
1 2 3 4

Funding Sources and Budget

9. To what degree does the plan identify funding sources for the long-term initiatives?

very little_____extensive
1 2 3 4

10. To what degree does the plan provide a budget summary covering expenditures for the duration of the plan?

very little_____extensive
1 2 3 4

Year One Action Plan

11. To what extent is a Year One Action Plan included? It should detail the specific activities, timelines, and leadership for the first year of implementation.

very little_____extensive
1 2 3 4

Monitoring and Evaluation

12. To what degree does the plan establish an adequate process for monitoring and evaluating implementation progress?

very little_____extensive
1 2 3 4

Comments:

Appendix Q

Proposed State and Regional Roles in PK-12 Educational Technology

This document provides a basis for discussion and mutual agreement between state and regional educational service providers regarding which entity is responsible for various aspects of educational technology. This discussion is already underway and the Summary Table provides one way to look at leadership and partnership roles. This document is similar in nature to other documents that delineate more specific activities within each provider's role.

The following educational technology roles can be identified.

State PK-12 Educational Technology Planning / Advocacy

The Department of Public Instruction engages in this role with all educational partners, including state agencies, cooperative educational service agencies (CESAs), local school districts and professional associations. The most recent example is the development of *The Wisconsin Educational Technology Plan PK-12* under DPI leadership with all the state educational partners participating on the task force that wrote the plan.

The state should, through all its agencies and grant programs, extend to the local level the information technology strategic planning model that has been so successfully used for state agencies. Such a strategy can be the process through which technology is integrated into teaching and learning.

Unless local school districts develop their goals first in a "business plan" and then a strategic technology plan, a major investment in infrastructure and programming will be wasted. The "business plan" for a local school district would be any school-improvement or district-wide educational plan that the district develops. The strategic technology plan would then articulate how it will move the district toward the goals it states. As the state education agency, the DPI is responsible for federal programs like the Improving America's Schools Act (IASA) and therefore is in the best position to give leadership to such integrated planning. DPI should provide this type of planning leadership to and through regional entities like the CESAs so that they can extend this to each local school district.

The state should also advocate for equitable and effective utilization of technology within PK-12 education and promote this through legislation, grant programs, and other statewide strategies.

Regional / Local PK-12 Educational Technology Planning and Consulting

Planning, consultation, and follow-up with schools and districts that request assistance with strategic technology planning is a major role for regional agencies. DPI consultants must work with regional consultants at the CESAs to ensure that local planning for educational technology is accomplished within the larger context of any major educational improvement program to which a school or district is committed. For example, if district staff members are writing or have written a School to Work plan, a Goals 2000 plan, a Village Partnership plan, or a consolidated IASA plan, CESA staff should assist them in developing a technology that is linked to that plan. DPI staff must work with CESA staff to disseminate this model.

PK-12 Infrastructure / Engineering Planning and Consulting

For technical infrastructure planning questions, DPI will provide information about the Educational Communications Board (ECB), CESAs and other agencies and private contractors. DPI does not see its role as providing technical engineering information, such as specifications for distance education systems, routers, satellite dishes, computer specs, etc. ECB should be the lead state agency in this role. CESAs and ECB staff should provide this expertise at the regional level.

Providing PK-12 Technology Staff Development

DPI provides planning documents, within publications or in handout form, that show school districts how to link all staff development for technology, including distance education, to school improvement and curriculum and instruction. Many staff development opportunities exist throughout the state and nation. The DPI will provide information about such opportunities, work with staff development providers to find the most effective ways of disseminating this information, and concentrate on including staff development in all technology plans.

Wisconsin educators need the wide variety of staff development resources already available in the state. CESAs are a major provider and universities and technical colleges are important partners. DPI staff does provide workshops and seminars related to specific programs it administers, such as all the IASA grant programs, Goals 2000 grants, financial aids administration, etc. ECB should provide the technology to help the sources of staff development content deliver their workshops and courses more effectively.

Overseeing Preservice Training in the Use of Technology

The DPI has responsibility for approving all programs of preservice education. As part of that approval process, DPI looks at the integration of technology into preservice education. The DPI must ensure that such integration is included in all programs.

Providing Preservice Education in the Use of Technology

All delivery of preservice education in Wisconsin is the responsibility of authorized programs in the University of Wisconsin System and private colleges and universities. It is the responsibility of these post-secondary institutions to incorporate technology into their teaching and learning.

Providing Statewide Infrastructure

The Department of Administration has primary responsibility for a statewide technology infrastructure. The BadgerNet project is the means of implementing such an infrastructure.

Providing Regional Infrastructure

Regional infrastructure is developing through consortia that are coordinated through the ECB. These consortia include multiple educational partners such as school districts, CESAs, technical colleges, and four-year universities. This regional infrastructure should continue to mature under regional leadership.

Developing PK-12 Curriculum Guidelines

DPI develops curriculum guides in most subject areas, including *The Guide to Computer Education Curriculum*. The computer education guide approaches this as a curriculum integrated throughout all disciplines. The most recent guides are being published in CD-ROM and print format. DPI uses technology to point to good sources of instructional resources. An example of this is the 400 links from the DPI Web site to other educational web sites on the Internet.

Producing PK-12 Broadcast Programming

ECB provides this service. DPI never has been nor does it anticipate producing broadcast programming. Its role in the production of PK-12 programming has been to participate with the ECB staff and contribute to the content.

PK-12 Status Reporting

DPI collects a large amount of data from Wisconsin schools and libraries, integrating that information into its agency enterprise database to provide an accurate, up-to-date picture of the

status of PK- 12 education in Wisconsin. This database has the capability to link the thousands of pieces of information to each other. The database is being constructed according to the state standards so that DPI data can readily be related to data from other agencies.

DPI should develop a more comprehensive data collection of PK- 12 technology related information. This should include not only technology infrastructure information, but also technology program information. DPI can relate this additional technology data to other collected demographic, programmatic, and assessment information about PK-12 public schools and public libraries in Wisconsin.

Summary Table

Leadership & Partnership Roles	DPI	UW	UW-X	WTCS	ECB	DOA	CESA
State PK-12 Educational Technology Planning /Advocacy	L				P	P	P
Regional/Local PK-12 Educational Technology Planning and Consulting	P/L						L
PK-12 Infrastructure/Engineering Planning and Consulting					L		P/L
Providing PK-12 Technology Staff Development	P	P	P	P	P		L
Overseeing Preservice Training in the Use of Technology	L	P					
Providing Preservice Education in the Use of Technology		L					
Providing Statewide Infrastructure						L	
Providing Regional Infrastructure		P	P	P	L		P
Developing PK-12 Curriculum Guidelines	L						
Producing PK-12 Broadcast Programming	P				L		
PK-12 Status Reporting	L						

Key
DPI–Department of Public Instruction
UW–University of Wisconsin System
UW-X– University of Wisconsin Extension
WTCS–Wisconsin Technical College System
ECB–Educational Communications Board
DOA–Department of Administration
CESA–Cooperative Educational Service Agencies

L = Leadership Role
P = Partnership Role